

FINAL
~~Draft~~ **Quality Assurance
Project Plan Addendum**

No. 0000100



99865

for the . . .

Remedial Investigation and Feasibility Study

of the . . .

**Skinner Landfill Site
West Chester, Ohio**

prepared for . . .

**U.S. Environmental Protection Agency
Region V
Chicago, Illinois**

EPA Contract No. 68-W8-0079
EPA Work Assignment No. 04-5L73
WW Engineering & Science Project No. 04003

WW Engineering & Science
Williams & Works, WW Facilities Group, EDI Engineering & Science
Grand Rapids, and Allen Park, MI; Omaha, NE



**ARCS Program Management Office
U.S. EPA Contract No. 68-W8-0079
Transmittal Form**

Date: 10/11/89

Attention: Fred Bartman, RPM WW Project No.: 04003.01

To: U.S. EPA U.S. EPA Assign. No.: _____

230 South Dearborn, (5HS-11) Project: Skinner Landfill Site

Chicago, IL 60604 Project Location: W. Chester, OH

We Are Sending You:

☐ Plans/Specs/Drawings ☐ Work Task Assignments/Change Orders ☒ Reports Revised QAPP sections

☐ Memorandums ☐ Contract Documents ☐ _____

| Quantity | Description |
|----------|--|
| 1 | Copy of the completed signature page and 1 copy of each page of text revised per letter from Valerie Jones, dated 9/29/89. |

These are Transmitted as Checked Below:

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| <input checked="" type="checkbox"/> Furnish as Submitted | <input type="checkbox"/> Rejected | <input type="checkbox"/> For Your Information |
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Remarks:

We are currently working on obtaining the standards necessary for the 7 additional extractables and pesticides. If we have trouble obtaining any, we will let you know as soon as possible.

CC: 04003, 32

By Elizabeth M. Uhl
Elizabeth M. Uhl

**Quality Assurance
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FINAL: Approved September 28, 1989**

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September, 1989

QUALITY ASSURANCE PROJECT PLAN (QAPP) ADDENDUM

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

**SKINNER LANDFILL
WEST CHESTER, OHIO**

EPA Remedial Project Manager

Fred R. Partman 10/3/89

WWES Site Project Manager

Julie A. Beaton 10/9/89

EPA QA Officer

Dale G. Jones 9/28/89

WWES Project QA Official

Dennise J. Galt 10/10/89

EPA CENTRAL REGIONAL LABORATORY DIRECTOR

Charles J. Eely 9/29/89

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Charles J. Eddy 9/29/89

QUALITY ASSURANCE PROJECT PLAN

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1.0 INTRODUCTION

1.1 General

This Quality Assurance Project Plan (QAPP) Addendum has been prepared for the U.S. Environmental Protection Agency (U.S. EPA) prior to the commencement of Phase II field activities at the Skinner Landfill site in West Chester, Ohio. This document has been developed under EPA Contract No. 68-W8-0079 by WW Engineering and Science (WWES). The QAPP Addendum will serve as the guidelines to be implemented for all personnel involved with field data collection, analytical services, and report preparation for this RI/FS program.

The Quality Assurance Project Plan (QAPP) Addendum has been developed in accordance with the guidelines presented in the U.S. EPA document "Interim Guidelines and Specifications for Preparing Quality Assurance Plans" (QAMS-005/80) and the U.S. EPA documents "Data Quality Objectives for Remedial Response Activities: Development Process (EPA 540/G-87/003)"; and Example Scenario (EPA 540/G-87/004). In addition, draft documents prepared by EPA/QAS which update the guidelines were consulted.

1.2 Summary of Project Goals, Objectives, and Use of Data

The ultimate goal of this RI/FS is to select the best possible remedial action alternative for the Skinner Landfill site in West Chester, Ohio. In order to achieve this goal it will be necessary to identify the nature of the environmental problems and collect a sufficient amount of information to develop, screen, and evaluate potential remedial alternatives. Phase II data gathering efforts on-site and off-site will include; private well sampling, a hydrogeologic investigation including soil borings, monitoring well installation, and ground water sampling, and lagoon waste, sediment, surface water and leachate sampling.

The primary objectives of the data gathering effort of this project are to obtain sufficient information to allow for an evaluation of the nature and extent of the contamination at the Skinner Landfill site and to support the selection of a remedial action alternative.

A secondary objective of the RI is to use the gathered data as a basis to evaluate the potential for endangerment to the public health, welfare, or environment. This assessment will project and/or predict potential exposure to the various receptor populations of concern.

A third objective of the RI study is to acquire data that can be used as evidence to support legal actions.

2.0 PROJECT DESCRIPTION

2.1 Background

Information on site history, response activities, and environmental setting is summarized in Section 1 of the Work Plan. The Work Plan also describes the proposed schedule (Section 5) for the proposed work. A Sampling Plan has been prepared for implementing the Phase II portion of the RI/FS for the Skinner Landfill site. The Sampling Plan is included as Appendix A of this QAPP Addendum.

2.2 RI/FS Objectives

The principal reason for conducting an RI is to assess the nature and extent of contamination and the threat caused by the migration of contaminants, or potential migration of contaminants. In addition, the information collected during the RI is used to aid in the development, screening, and assessment of potential remedial action alternatives. While developing the project plans for the RI/FS the following objectives were identified:

1. Determine the characteristics and extent of contamination at the site.
2. Better define the pathways of contaminant migration.
3. Better define the physical features that could affect contaminant migration, containment or remediation.
4. Assess the risk to public health and the environment posed by on-site contaminants, if any.
5. Gather information necessary to support the feasibility study.
6. Conduct a feasibility study to identify the best method for solving actual or potential contamination problems discovered by the remedial investigation.
7. Solicit input from the public on the work needed and solutions which are acceptable and keep the public informed of study progress.

2.3 Quality Assurance Objectives

The overall Management Objectives for this Quality Assurance Project Plan Addendum are as follows:

1. To ensure that the quality of data generated by the study meets the goals of the RI/FS;

2. To maintain the value of any data produced in this study for use as evidence in any legal action or suit;
3. To ensure the validity and integrity of the results of the site investigations, laboratory analyses, and/or technical reports;
4. To ensure that remedial assessments, actions, and designs are properly prepared and approved; and
5. To oversee the quality of work performed by subcontractors.

The RI/FS Program Quality Assurance procedures adopted for this QAPP Addendum will be implemented under the direction of the EPA Remedial Project Manager and WWES's Project Quality Assurance Officer, and will be based upon approved quality assurance policies. The analytical laboratory portion of the RI/FS program will be implemented under the direction of the U.S.EPA Central Regional Lab. These policies provide assurance that all investigations will yield valid results which comply with applicable federal and state regulations, and legal requirements for enforcement proceedings.

Activities conducted for the Skinner Landfill site RI/FS project will comply with these policies and procedures and will be implemented in accordance with directives issued by the respective Quality Assurance Officers. The EPA will be responsible for conducting performance and system audits during the RI/FS. WWES will also perform performance audits during field activities.

2.4 Use of Acquired Data

Data collected during the RI portion of the study will ultimately be used to evaluate remedial action alternatives and to select the appropriate remedy that will alleviate threats to and provide for the protection of public health, welfare and the environment.

The data gathered during the Skinner Landfill RI/FS will be used primarily by the U.S. EPA, WW Engineering and Science personnel, and the Agency for Toxic Substance and Disease Registry (ATSDR). The data collected can be characterized and separated into two broad categories; quantitative and qualitative.

2.4.1 Data Quality Objectives for Analytical Data

Quantitative data includes the analysis of samples using the Central Regional Laboratory (CRL) and the Contract Laboratory Program (CLP). CRL data and CLP (RAS) data fall under the Level IV category for data quality objectives. CLP (SAS) data fall under the Level V category for data quality objectives. These data will be used to help assess the magnitude of contamination, develop

remedial action alternatives and adequately determine the existing or potential threat to human health and the environment.

2.4.2 Data Quality Objectives for Field Instruments

The qualitative data that will be collected fall under Level I and Level II categories for data quality objectives. The HNu and/or OVA and/or OVM instruments will be used to field screen split spoon samples for making decisions as to which samples will be sent to the analytical laboratory. These instruments along with the CG/O₂/H₂S meter, Cyanide Monotox and draeger tubes will be used for health and safety purposes to make decisions regarding upgrading and/or downgrading to certain levels of personnel protection.

Hydraulic conductivity testing and borehole geophysics (Level II-DQO) will provide additional geologic and hydrogeologic data to better characterize the properties of the uppermost aquifer.

Water quality data including pH, specific conductivity, and temperature are considered Level I under the data quality guidelines. These data will be used to qualitatively screen the ground water, surface water, and leachate samples.

Static water levels will be collected to provide data regarding ground water flow directions, and vertical and horizontal ground water gradients (Level I-DQO).

2.5 Site Investigation Design and Rationale

The field investigation is designed to confirm the presence of and evaluate the extent of contaminants on the Skinner Landfill property. Table 1 presents the Phase II sampling and analysis plan.

To obtain the data necessary to perform the RI site investigation activities and subsequent risk assessment activities, various on-site and off-site matrices must be sampled. These matrices include; lagoon waste, ground water, surface water, leachate, sediment, and soil. Each matrix will be sampled from multiple locations and analyzed for various parameters using the appropriate methods. All samples will be sent to an EPA approved Contract Lab through the Contract Lab Program (CLP) or in the case of the private wells, to the Central Regional Lab (CRL).

The RI site investigation was developed after a review of available historical records and data. Previous data is included as an Attachment to the Sampling Plan. The rationale for sampling the various matrices is described in Table 2.

TABLE 1-A
SAMPLING AND ANALYSIS PROGRAM SUMMARY
PRIVATE WELLS
SKINNER LANDFILL SITE

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DOO (2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | TOTAL SAMPLES |
|----------------------------------|---|--------------------------------|---------------------------------------|-------------------------------------|----------------|---------------|--------------------|---------------|------------------|
| | | | | DUPLICATE | FIELD BLANK | TRIP BLANK | TOTAL BLANKS(3) | MS/ MSD(4) | |
| Private Wells (Low Hazard) | Volatile organics from CRL or CLP (SAS). Additional BAS+ SAS for methylene chloride | IV or V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 5 | 6 (to 7) | 1 (to 2) | 17 (to 29) |
| | Acid extractables and base/neutral extractables from CRL or CLP (SAS) | IV or V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 0 | 1 (to 2) | 1 (to 2) | 12 (to 24) |
| | Pesticides and PCBs from CRL or CLP (SAS) | IV or V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 0 | 1 (to 2) | 1 (to 2) | 12 (to 24) |
| | Metals from CRL or CLP (SAS) unfiltered samples | IV or V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 0 | 1 (to 2) | 1 (to 2) | 12 (to 24) |
| | SAS for Additional Pesticides from CLP | V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 0 | 1 (to 2) | 1 (to 2) | 12 (to 24) |
| | SAS for chloride, sulfate from CLP | V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 0 | 1 (to 2) | 1 (to 2) | 12 (to 24) |
| | SAS for acidity, alkalinity, and pH from CLP | V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 0 | 1 (to 2) | 1 (to 2) | 12 (to 24) |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

(1) In addition to the laboratory parameters, the pH, specific conductivity, and temperature will be collected from each sample in the field.

(2) DOO - Data quality Objective

(3) The number of blanks are estimated only. The number may vary depending on field conditions. Triple the normal sample volume for VOCs and double the normal sample volume for BNAS is required. MS/MSD samples are not counted into the total number of samples.

(4) MS/MSD - Matrix spike/Matrix spike duplicate. Extra volume of water samples are required for MS/MSD analyses. Triple the normal sample volume for VOCs and double the normal sample volume for BNAS is required. MS/MSD samples are not counted into the total number of samples. Must specify on paperwork which sample is the MS/MSD sample, however.

TABLE 1-A (Continued)
SAMPLING AND ANALYSIS PROGRAM SUMMARY
PRIVATE WELLS
SKINNER LANDFILL SITE

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DOO (2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | | TOTAL MS/ MSD(4) | TOTAL SAMPLES |
|----------------------------------|-------------------------------------|--------------------------------|---------------------------------------|-------------------------------------|----------------|---------------|--------------------|----------|--|------------------------|------------------|
| | | | | DUPLICATE | FIELD BLANK | TRIP BLANK | TOTAL BLANKS(3) | | | | |
| Private Wells (Low Hazard) | SAS for nitrate-nitrite from CLP | V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 0 | 1 (to 2) | 1 (to 2) | | 1 (to 2) | 12 (to 24) |
| | SAS for ammonia from CLP | V | 10 (to 20) | 1 (to 2) | 1 (to 2) | 0 | 1 (to 2) | 1 (to 2) | | 1 (to 2) | 12 (to 24) |

(1) In addition to the laboratory parameters, the pH, specific conductivity, and temperature will be collected from each sample in the field.

(2) DOO - Data Quality Objective

(3) The number of blanks are estimated only. The number may vary depending on field conditions.

(4) MS/MSD - Matrix spike/Matrix spike duplicate. Extra volume of water samples are required for MS/MSD analyses. Triple the normal sample volume for VOCs and double the normal sample volume for BHAs is required. MS/MSD samples are not counted into the total number of samples. One MS/MSD samples will be collected for every ten samples or less. No extra volume is required for MS/MSD SAS or CRL Inorganics. Must specify on paperwork which sample is the MS/MSD sample, however.

TABLE 1-B
SAMPLING AND ANALYSES PROGRAM SUMMARY
GROUND WATER
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DOO(2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | DUPLICATE | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | TOTAL SAMPLES |
|---|--|-------------------------------|---------------------------------------|-----------|-------------------------------------|----------------------|---------------|---------------------|---------------|------------------|
| | | | | | FIELD BLANK | ATMOSPHERIC BLANK | TRIP BLANK | TOTAL BLANKS (3) | MS/MSD (4) | |
| Groundwater (Low and Medium Hazard) | RAS organics package from CLP including 30 tentatively identified parameters. Additional RAS+SAS for methylene chloride | IV | 31 | 4 | 4 | 0 | 0 | 4 | 2 | 39 |
| | RAS organics package from CLP VOA's only (blank samples only) | IV | 0 | 0 | 0 | 6 | 6 | 12 | 0 | 12 |
| | RAS inorganics/metals package from CLP, filtered samples | IV | 31 | 4 | 4 | 0 | 0 | 4 | 2 | 39 |
| | RAS inorganics/cyanide package from CLP, unfiltered samples | IV | 31 | 4 | 4 | 0 | 0 | 4 | 2 | 39 |
| | SAS for additional pesticides from CLP | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |
| | SAS for sulfate, chloride from CLP | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |
| | SAS for acidity, alkalinity and pH from CLP | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |

(1) In addition to the laboratory parameters, pH, specific conductivity and temperature measurements will be collected from each sample in the field.

(2) DOO - Data Quality Objective

(3) The number of blanks are estimated only. The number may vary depending on field conditions.

(4) MS/MSD - Matrix spike/matrix spike duplicate. Extra volume of water samples are required for MS/MSD analyses. Triple the normal sample volume for VOCs and double the normal volume for BNAs is required. MS/MSD samples are not counted into the total number of samples. One MS/MSD sample will be collected for every 20 or less RAS samples. One MS/MSD sample will be collected for every 10 or less SAS samples. No extra volume is required for MS/MSD SAS or RAS Inorganics, must indicate on paperwork MS/MSD sample, however.

TABLE 1-B (Continued)
SAMPLING AND ANALYSES PROGRAM SUMMARY
GROUND WATER
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DQO(2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | DUPLICATE | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | TOTAL SAMPLES |
|---|---|-------------------------------|---------------------------------------|-----------|-------------------------------------|----------------------|---------------|---------------------|---------------|------------------|
| | | | | | FIELD BLANK | ATMOSPHERIC BLANK | TRIP BLANK | TOTAL BLANKS (3) | MS/MSD (4) | |
| Groundwater (Low and Medium Hazard) | SAS BOD and COD from CLP | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |
| | SAS for ammonia from CLP | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |
| | SAS for TKN from CLP | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |
| | SAS for TOC from CLP | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |
| | SAS for Total phosphorus from CLP filtered samples | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |
| | SAS for nitrate/nitrite from CLP | V | 31 | 4 | 4 | 0 | 0 | 4 | 4 | 39 |

(1) In addition to the laboratory parameters, pH, specific conductivity and temperature measurements will be collected from each sample in the field.

(2) DQO - Data Quality Objective

(3) The number of blanks are estimated only. The number may vary depending on field conditions.

(4) MS/MSD - Matrix spike/matrix spike duplicate. Extra volume of water samples are required for MS/MSD analyses. Triple the normal sample volume for VOCs and double the normal volume for BNAs is required. MS/MSD samples are not counted into the total number of samples. One MS/MSD sample will be collected for every 20 or less RAS samples. One MS/MSD sample will be collected for every 10 or less SAS samples. No extra volume is required for MS/MSD SAS or RAS Inorganics, must indicate on paperwork MS/MSD sample, however.
EXCEPTION: Collect double volume for BOD MS/MSD.

TABLE 1-C
SAMPLING AND ANALYSES PROGRAM SUMMARY
LEACHATE
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DQO(2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | DUPLICATE | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | TOTAL SAMPLES |
|-----------------------------|---|-------------------------------|---------------------------------------|-----------|-------------------------------------|----------------------|---------------|---------------------|---------------|------------------|
| | | | | | FIELD BLANK | ATMOSPHERIC BLANK | TRIP BLANK | TOTAL BLANKS (3) | MS/MSD (4) | |
| Leachate (Medium Hazard) | RAS organics package from CLP including 30 tentatively identified parameters. Additional RAS+SAS for methylene chloride | IV | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 5 |
| | RAS organics package from CLP VOA's only (blank samples only) | IV | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 2 |
| | RAS inorganics/metals package from CLP, unfiltered samples | IV | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 5 |
| | RAS inorganics/cyanide package from CLP, unfiltered samples | IV | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 5 |
| | SAS for additional pesticides from CLP | V | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 5 |
| | SAS for sulfate, chloride from CLP | V | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 5 |
| | SAS for acidity, alkalinity and pH from CLP | V | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 5 |

- (1) In addition to the laboratory parameters, pH, specific conductivity and temperature measurements will be collected from each sample in the field.
 (2) DQO - Data Quality Objective
 (3) The number of blanks are estimated only. The number may vary depending on field conditions.
 (4) MS/MSD - Matrix spike/matrix spike duplicate. Extra volume of water samples are required for MS/MSD analyses. Triple the normal sample volume for VOCs and double the normal volume for BNAs is required. MS/MSD samples are not counted into the total number of samples. One MS/MSD sample will be collected for every 20 or less RAS samples. One MS/MSD sample will be collected for every 10 or less SAS samples. No extra volume is required for MS/MSD samples for SAS or RAS Inorganics. Must specify the MS/MSD sample on the paperwork, however.

TABLE 1-C (Continued)
SAMPLING AND ANALYSES PROGRAM SUMMARY
LEACHATE
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DOO(2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | DUPLICATE | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | | | TOTAL MS/MSD (4) | TOTAL SAMPLES |
|-----------------------------|--|-------------------------------|---------------------------------------|-----------|-------------------------------------|----------------------|---------------|---------------------|---|---|---|------------------------|------------------|
| | | | | | FIELD BLANK | ATMOSPHERIC BLANK | TRIP BLANK | TOTAL BLANKS (3) | | | | | |
| Leachate (Medium Hazard) | SAS for nitrate-nitrite from CLP | V | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 5 | |
| | SAS BOD and COD from CLP | V | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 5 | |
| | SAS for ammonia from CLP | V | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 5 | |
| | SAS for TKN from CLP | V | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 5 | |
| | SAS for TOC from CLP | V | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 5 | |
| | SAS for phosphorus from CLP, filtered samples | V | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 5 | |

- (1) In addition to the laboratory parameters, pH, specific conductivity and temperature measurements will be collected from each sample in the field.
- (2) DOO - Data Quality Objective
- (3) The number of blanks are estimated only. The number may vary depending on field conditions.
- (4) MS/MSD - Matrix spike/matrix spike duplicate. Extra volume of water samples are required for MS/MSD analyses. Triple the normal sample volume for VOCs and double the normal volume for BHAs is required. MS/MSD samples are not counted into the total number of samples. One MS/MSD sample will be collected for every 20 or less RAS samples. One MS/MSD sample will be collected for every 10 or less SAS samples. No extra volume is required for MS/MSD samples for SAS or RAS Inorganics. Must specify the MS/MSD sample on the paperwork, however.
- EXCEPTION: Collect double volume for BOD MS/MSD.

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TABLE 1-D
SAMPLING AND ANALYSIS PROGRAM SUMMARY
SURFACE WATER
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DQO (2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | | TOTAL SAMPLES |
|-------------------------------|--|--------------------------------|---------------------------------------|-------------------------------------|----------------|----------------------|---------------|--------------------|---------------|------------------|
| | | | | DUPLICATE | FIELD BLANK | ATMOSPHERIC BLANK | TRIP BLANK | TOTAL BLANKS(3) | MS/MSD (4) | |
| Surface Water (Low Hazard) | RAS organics package from CLP including 30 tentatively identified parameters. Additional RAS+SAS for methylene chloride. | IV | 40 | 4 | 4 | 0 | 0 | 4 | 2 | 48 |
| | RAS organics package from CLP VOA's only (blank samples only) | IV | 0 | 0 | 0 | 8 | 8 | 16 | 0 | 16 |
| | RAS inorganics/metals package from CLP, unfiltered samples | IV | 40 | 4 | 4 | 0 | 0 | 4 | 2 | 48 |
| | RAS inorganics/cyanide package from CLP, unfiltered samples | IV | 40 | 4 | 4 | 0 | 0 | 4 | 4 | 48 |
| | SAS for sulfate, chloride from CLP | V | 40 | 4 | 4 | 0 | 0 | 4 | 4 | 48 |
| | SAS for nitrate-nitrite from CLP | V | 40 | 4 | 4 | 0 | 0 | 4 | 4 | 48 |
| | SAS for ammonia from CLP | V | 40 | 4 | 4 | 0 | 0 | 4 | 4 | 48 |
| | SAS for alkalinity, pH, and acidity from CLP | V | 40 | 4 | 4 | 0 | 0 | 4 | 4 | 48 |

(1) In addition to the laboratory parameters, the pH, specific conductivity and temperature will be collected from each sample in the field.

(2) DQO - Data Quality Objective

(3) The number of blanks are estimated only. The number may vary depending on field conditions.

(4) MS/MSD - Matrix spike/Matrix spike duplicate. Extra volume of water samples are required for MS/MSD analyses. Triple the normal sample volume for VOCs and double the normal volume for BNA's is required. MS/MSD samples are not counted into the total number of samples. One MS/MSD sample will be collected for every 20 or less RAS samples. One MS/MSD sample will be collected for every 10 or less SAS samples. No extra volume is required for MS/MSD SAS or RAS Inorganics. Must indicate on paperwork MS/MSD sample, however.

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TABLE 1-D (Continued)
SAMPLING AND ANALYSIS PROGRAM SUMMARY
SURFACE WATER
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DOO (2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | | TOTAL SAMPLES |
|-------------------------------|--|--------------------------------|---------------------------------------|-------------------------------------|----------------|----------------------|---------------|--------------------|---------------|------------------|
| | | | | DUPLICATE | FIELD BLANK | ATMOSPHERIC BLANK | TRIP BLANK | TOTAL BLANKS(3) | MS/MSD (4) | |
| Surface Water (Low Hazard) | SAS for TDS, TSS from CLP | V | 40 | 4 | 4 | 0 | 0 | 4 | 4 | 48 |
| | SAS for Total Phosphorus from CLP, filtered samples | V | 40 | 4 | 4 | 0 | 0 | 4 | 4 | 48 |
| | SAS for Additional Pesticides | V | 40 | 4 | 4 | 0 | 0 | 4 | 4 | 48 |

(1) In addition to the laboratory parameters, the pH, specific conductivity and temperature will be collected from each sample in the field.

(2) DOO - Data Quality Objective

(3) The number of blanks are estimated only. The number may vary depending on field conditions.

(4) MS/MSD - Matrix spike/Matrix spike duplicate. Extra volume of water samples are required for MS/MSD analyses. Triple the normal sample volume for VOCs and double the normal volume for BNA's is required. MS/MSD samples are not counted into the total number of samples. One MS/MSD sample will be collected for every 20 or less RAS samples. One MS/MSD sample will be collected for every 10 or less SAS samples. No extra volume is required for MS/MSD SAS or RAS Inorganics. Must indicate on paperwork MS/MSD sample, however.

TABLE 1-E
SAMPLING AND ANALYSIS PROGRAM SUMMARY
SEDIMENT
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DQO (2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | TOTAL SAMPLES |
|--------------------------|---|--------------------------------|---------------------------------------|-------------------------------------|----------------|----------------------|---------------------|---------------|------------------|
| | | | | DUPLICATE | FIELD BLANK | ATMOSPHERIC BLANK | TOTAL BLANKS (3) | MS/MSD (4) | |
| Sediment (Low Hazard) | RAS organics package from CLP including 30 tentatively identified parameters. Additional RAS+SAS for methylene chloride. | IV | 40 | 4 | 4 | 0 | 8 | 2 | 48 |
| | RAS organics package from CLP VOA's only (blank samples only) | IV | 0 | 0 | 0 | 8 | 8 | 0 | 8 |
| | RAS inorganics/metals package from CLP | IV | 40 | 4 | 4 | 0 | 8 | 2 | 48 |
| | RAS inorganics/cyanide package from CLP | IV | 40 | 4 | 4 | 0 | 8 | 2 | 48 |
| | SAS for Additional Pesticides from CLP | V | 40 | 4 | 4 | 0 | 8 | 4 | 48 |
| | SAS for TOC from CLP | V | 40 | 4 | 4 | 0 | 8 | 4 | 48 |

- (1) In addition to the laboratory parameters, each sample will be qualitatively field screened with an OVA and/or HNU.
 (2) DQO - Data Quality Objective
 (3) The number of blanks are estimated only. The number may vary depending on field conditions.
 Sediment blanks will not be prepared. The blank samples will be a water matrix.
 (4) MS/MSD - Matrix spike/Matrix spike duplicate. One MS/MSD sample will be collected for every 20 or less RAS samples.
 One MS/MSD sample will be collected for every 10 or less SAS samples. MS/MSD samples are not counted into the total
 number of samples. No extra volume is required for MS/MSD SAS or RAS Inorganics. Must specify MS/MSD sample on the
 paperwork, however.

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TABLE 1-F
SAMPLING AND ANALYSIS PROGRAM SUMMARY
SOIL
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DOO (2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | TOTAL MS/MSD (4) | TOTAL SAMPLES |
|------------------------------------|---|--------------------------------|---------------------------------------|-------------------------------------|----------------|----------------------|--------------------|---|------------------------|------------------|
| | | | | DUPLICATE | FIELD BLANK | ATMOSPHERIC BLANK | TOTAL BLANKS(3) | | | |
| Soil (Low and Medium Hazard) | RAS organics package from CLP including 30 tentatively identified parameters. Additional RAS+SAS for methylene chloride. | IV | 66 | 7 | 7 | 0 | 7 | 4 | 80 | |
| | RAS organics package from CLP VOA's only (Blank samples only) | IV | 0 | 0 | 0 | 7 | 0 | 7 | 7 | |
| | RAS inorganics/metals package from CLP | IV | 66 | 7 | 7 | 0 | 7 | 4 | 80 | |
| | RAS inorganics/cyanide package from CLP | IV | 66 | 7 | 7 | 0 | 7 | 4 | 80 | |
| | SAS for Dioxin from CLP | V | 25 | 3 | 3 | 0 | 3 | 3 | 31 | |
| | SAS for Additional Pesticides from CLP | V | 66 | 7 | 7 | 0 | 7 | 7 | 80 | |
| | SAS for TOC | V | 66 | 7 | 7 | 0 | 7 | 7 | 80 | |

(1) In addition to the laboratory parameters, the samples will be qualitatively field screened with an OVA and/or HNu.

(2) DOO - Data Quality Objective

(3) The number of blanks are estimated only. The number may vary depending on field conditions.

(4) MS/MSD - Matrix spike/Matrix spike duplicate. One MS/MSD sample will be collected for every 20 or less RAS samples.

One MS/MSD sample will be collected for every 10 or less SAS sample. MS/MSD samples are not counted in the total

number of samples. No extra sample volume is required for MS/MSD SAS or RAS Inorganics. Must specify the MS/MSD

sample on the paperwork, however.

TABLE 1-G
SAMPLING AND ANALYSIS PROGRAM SUMMARY
WASTE SAMPLES
SKINNER LANDFILL

| SAMPLE MATRIX | LABORATORY PARAMETERS (1) | DQO (2) ANALYTICAL LEVEL | NUMBER OF INVESTIGATIVE SAMPLES | NUMBER OF QUALITY ASSURANCE SAMPLES | | | | | TOTAL SAMPLES |
|--------------------------------|---|--------------------------------|---------------------------------------|-------------------------------------|----------------|----------------------|--------------------|---------------|------------------|
| | | | | DUPLICATE | FIELD BLANK | ATMOSPHERIC BLANK | TOTAL BLANKS(3) | MS/MSD (4) | |
| Waste Samples (High Hazard) | RAS organics package from CLP including 30 tentatively identified parameters. Additional RAS+SAS for methylene chloride. | IV | 48 | 5 | 5 | 0 | 5 | 3 | 58 |
| | RAS organics package from CLP VOA's only (Blank samples only) | IV | 0 | 0 | 0 | 15 | 15 | 0 | 15 |
| | RAS inorganics/metals package from CLP | IV | 48 | 5 | 5 | 0 | 5 | 3 | 58 |
| | RAS inorganics/cyanide package from CLP | IV | 48 | 5 | 5 | 0 | 5 | 3 | 58 |
| | SAS for Dioxin from CLP | IV | 48 | 5 | 5 | 0 | 5 | 5 | 58 |
| | SAS for Additional Pesticides from CLP | V | 48 | 5 | 5 | 0 | 5 | 5 | 58 |
| | SAS for Incineration parameters (including carbon, hydrogen, sulfur, oxygen, nitrogen, moisture content, ash content, and heating value) from CLP | V | 48 | 5 | 5 | 0 | 5 | 5 | 58 |

(1) In addition to the laboratory parameters, the samples will be qualitatively field screened with an OVA and/or HNU.

(2) DQO - Data Quality Objective

(3) The number of blanks are estimated only. The number may vary depending on field conditions.

The blank samples will be a water matrix.

(4) MS/MSD - Matrix spike/Matrix spike duplicate. One MS/MSD sample will be collected for every 20 or less RAS samples. One MS/MSD sample will be collected for every 10 or less SAS analyses. MS/MSD samples are not counted into the total number of samples. No extra sample volume is required for MS/MSD SAS or RAS Inorganics. Must specify MS/MSD sample on the paperwork, however.

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TABLE 2
SAMPLING RATIONALE
SKINNER LANDFILL SITE

| LABORATORY PARAMETERS | MATRICES | RATIONALE FOR ANALYSIS |
|--|---|--|
| RAS Organics and RAS Inorganics | Groundwater Surface Water Leachate Soil Sediment | Previous data indicates there are elevated concentrations of organics and inorganics in most media on the site. |
| RAS for High Hazard Organics and Inorganics | Waste Samples | Previous data indicates there are elevated concentrations of organics and inorganics in most media on the site. |
| CRL or SAS Organics and Inorganics | Private Wells | Determine if contaminants leaving the site have impacted potable wells in the area. |
| SAS Additional Pesticides | Groundwater Private Wells Leachate Soil Sediment Waste Samples | Previous data collected indicates that these parameters were present in the buried lagoon. |
| SAS for BOD, COD, TOC, TKN, and total phosphorus | Groundwater Leachate | Necessary for the selection of treatment alternatives and is also necessary information to provide the local POTW to assess the potential loading to their treatment plant. |
| SAS for TDS, TSS, and total phosphorus | Surface Water | General Surface Water quality parameters used to assess the degradation of surface water bodies impacted by contaminants from the site. |
| SAS for nitrate/nitrite and ammonia | Groundwater Private Wells Surface Water Leachate | General water quality parameters used to assess the degradation of groundwater and surface waters. |
| SAS for sulfate and chloride | Groundwater Private Wells Surface Water Leachate | General water quality parameters used to assess the degradation of groundwater and surface waters. Sulfate is a fingerprint compound for gunpowder which was allegedly buried in the lagoon. |
| SAS for acidity, alkalinity, and pH | Groundwater Private Wells Surface Water Leachate | Necessary to know the concentration of alkalinity in the groundwater and surface water to determine the potential for calcium carbonate precipitation in an air stripping column, steam stripping column, or activated carbon bed. |

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TABLE 2 (Continued)
SAMPLING RATIONALE
SKINNER LANDFILL SITE

| LABORATORY PARAMETERS | MATRICES | RATIONALE FOR ANALYSIS |
|---------------------------------|-----------------------|--|
| SAS for TOC | Soil Sediment | Measure the organic strength in each media. Necessary for the selection of a treatment alternative. |
| SAS for Dioxin/Furans | Waste Samples Soil | Site history indicates that incineration operations occurred near the buried lagoon in the past. The presence or absence of dioxin/furans may affect the selection of a treatment alternative. |
| SAS for Incineration Parameters | Waste Samples | Necessary to determine if incineration of the waste from the buried lagoon is a potential treatment alternative. |

Three different types of blank samples will be prepared during sampling events at the Skinner Landfill site:

Field blanks will be collected to evaluate the effectiveness of the decontamination procedures. Field blank samples will be prepared at a rate of one blank for every ten or less investigative samples. Analysis of these samples will be the full list of RAS organics, RAS inorganics, and SAS parameters designated for those particular matrices. In addition; field filtering and preservation techniques of field blank samples will be identical to those performed on investigative and duplicate samples.

Atmospheric blank samples will be prepared each day to evaluate sample contamination from atmospheric factors. Trip blank samples will also be prepared in order to assess the potential for cross-contamination during shipment. Atmospheric and trip blanks will be analyzed for volatile organics only and have been designated as such on Table 1 for purposes of sample scheduling. The number of atmospheric and trip blanks has been calculated to represent at least one atmospheric and trip blank (each) to be prepared each day, which may actually reflect more than one blank per every ten investigative samples. Trip blanks will accompany each cooler containing VOC samples.

Table 3 presents the sample containers, preservation, shipping and packaging requirements necessary for the collection of samples at the Skinner Landfill site.

2.6 Project Schedule

The tentative schedule for the Skinner Landfill RI/FS is contained in Section 5.0 of the Work Plan.

TABLE 3
SAMPLE CONTAINERS, PRESERVATION, SHIPPING, AND PACKAGING REQUIREMENTS

| <u>Analysis</u> | <u>Container per Sample</u> | <u>Preservation</u> | <u>Holding Time</u> | <u>Shipping</u> | <u>Packaging</u> |
|--|-------------------------------------|---|---|----------------------|--|
| <u>GROUNDWATER AND SURFACE WATER</u> | | | | | |
| <u>Private Well Samples (low concentration)</u> | | | | | |
| Volatile Organics | Three 40 ml glass vials | Cool, 4°C. Samples must be free of head space | 7 days from collection | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack |
| Acid/Base/Neutral Organics, | Three 1 liter amber glass bottle | Cool 4°C. Fill bottles completely | 5 days until extraction 40 days after extraction | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack |
| Pest/PCB | Three 1 liter amber glass bottle | Cool 4°C. Fill bottles completely | 5 days until extraction 40 days after extraction | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack |
| Cyanide | One 1 liter polyethylene bottle | 6N NaOH to a pH>12 Cool, 4°C. | 14 days | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack |
| Metals | One 1 liter polyethylene bottle | 5 ml of 50% HNO ₃ and cooled to 4°C. | 6 months | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack |

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TABLE 3 (cont)

SAMPLE CONTAINERS, PRESERVATION, SHIPPING, AND PACKAGING REQUIREMENTS

| <u>Analysis</u> | <u>Container per Sample</u> | <u>Preservation</u> | <u>Holding Time</u> | <u>Shipping</u> | <u>Packaging</u> |
|--|---|--|---|-------------------|--|
| Mercury | One 1 liter polyethylene bottle | 10 ml of preservative containing 0.05% (w/v) $K_2Cr_2O_7$ and 0.5% (w/v) HNO_3 to pH < 2 Cooled to 4°C. | 26 days | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack |
| <u>Low Concentration (RAS) Waters</u> | | | | | |
| Acid and base/neutral extractables, pesticides/PCB's | Two 80 oz. glass amber bottles (teflon-lined caps). | Must be iced to 4°C Fill bottles completely. | 5 days until extraction 40 days for analysis | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack |
| Volatiles | Two 40-ml glass vials /VOA vials. | 1/10th ml of HCL Must be iced to 4°C Samples must be free of headspace. | 10 days | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack |
| Metals, Filtered Metals, Unfiltered | One 1-liter high density polyethylene bottle. Fill to shoulder of bottle | Cool to 4°C. 1 ml HNO_3 to pH < 2 | 6 months 26 days | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack |
| Cyanide | One 1-liter high density polyethylene bottle. Fill to shoulder of bottle. | Cool to 4°C. 1 ml 6N NaOH to pH > 12 | 14 days | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack. |
| <u>Special Analytical Service (SAS) Waters</u> | | | | | |
| TSS, TDS | Two 1-liter polyethylene bottles. Fill to shoulder of bottle. | Cool to 4°C | 7 days for TSS and TDS | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack |

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TABLE 3 (cont)
SAMPLE CONTAINERS, PRESERVATION, SHIPPING, AND PACKAGING REQUIREMENTS

| <u>Analysis</u> | <u>Container per Sample</u> | <u>Preservation</u> | <u>Holding Time</u> | <u>Shipping</u> | <u>Packaging</u> |
|----------------------------|---|--|---|-------------------|---|
| Alkalinity, acidity, pH | One 1 - liter polyethylene bottle | Cool to 4°C | 14 days | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack. |
| TOC,COD, ammonia, TKN | Two 1-liter polyethylene bottles. Fill to shoulder of bottle. | 1 ml/l H ₂ SO ₄ to pH<2 Cool at 4°C | 28 days | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack. |
| Chloride, Sulfate | One 1-liter polyethylene bottle | Cool, 4°C | 28 days | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack. |
| Nitrate/Nitrite | 500 mL/polyethylene bottle | 1 ml/l of H ₂ SO ₄ to pH<2 Cool at 4°C | 28 days | Overnight carrier | In baggies or sur- rounded by vermi- culite or bubble pack. |
| Phosphorus, total | 500 mL polyethylene bottle | 1 ml/l of H ₂ SO ₄ to pH<2 Cool at 4°C | 28 days | Overnight carrier | In baggies or sur- rounded by vermi- culite or bubble pack. |
| Additional Pesticides | Three 1-liter amber glass bottle | Cool at 4°C, Fill bottles completely | 5 days until Extraction 40 days after Extraction | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack. |
| BOD | 500 mL polyethylene bottle | Cool to 4°C | 48 hours | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack. |

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TABLE 3 (cont)
 SAMPLE CONTAINERS, PRESERVATION, SHIPPING, AND PACKAGING REQUIREMENTS

| <u>Analysis</u> | <u>Container per Sample</u> | <u>Preservation</u> | <u>Holding Time</u> | <u>Shipping</u> | <u>Packaging</u> |
|---|---|---------------------|--|-------------------------------|--|
| <u>Medium Concentration (RAS and SAS) Waters</u> | | | | | |
| Volume and holding time identical to low concentration samples. Chemical Preservatives are not added to medium concentration samples. | | | | Overnight, cargo only carrier | Per instructions in Appendix G |
| <u>SOIL AND SEDIMENT</u> | | | | | |
| <u>Low Concentration (RAS)</u> | | | | | |
| Acid, base/neutral, pesticide/PCB's extractables | One 8-oz. wide mouth glass jar. Fill 3/4 full. | Cool to 4°C. | 10 days for extraction 40 days for analysis | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack. |
| Volatiles | Two 120-ml wide mouth glass vials. Fill completely, no headspace. | Cool to 4°C. | 10 days | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack. |
| Metals Cyanide | One 8-oz. wide mouth glass jar. Fill 3/4 full. | Cool to 4°C. | 6 months 14 days | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack. |
| <u>Low Concentration (SAS)</u> | | | | | |
| TOC | One 8-oz wide mouth glass jar. Fill 3/4 full. | Cool at 4°C | 28 days | Overnight carrier | In baggies and surrounded by vermiculite or bubble pack. |

TABLE 3 (cont)
SAMPLE CONTAINERS, PRESERVATION, SHIPPING, AND PACKAGING REQUIREMENTS

| <u>Analysis</u> | <u>Container per Sample</u> | <u>Preservation</u> | <u>Holding Time</u> | <u>Shipping</u> | <u>Packaging</u> |
|--|---|---------------------|---|-------------------------------------|---|
| Additional Pesticides | One 8-oz wide mouth glass jar. Fill 3/4 full. | Cool at 4°C | 5 days until extraction 40 days after extraction | Overnight carrier | In baggies and sur- rounded by vermi- culite or bubble pack. |
| <u>Medium Concentration (RAS and SAS)</u> | | | | | |
| Volume and holding time identical to low concentration samples | | | | Overnight, cargo only carrier | Per instructions in Appendix G |
| <u>LAGOON WASTE</u> | | | | | |
| Solid Samples - organic and inorganic | 2 - 4oz wide mouth glass jars | No Preservatives | 30 days | Overnight, cargo only carrier | Per instructions in Appendix G |
| Dioxin | 2-4oz wide mouth glass jars | No preservatives | 30 days | Overnight, cargo only carrier | Per instructions in Appendix G |
| Incineration Parameters | 8 - 8 oz wide mouth glass jars | No preservatives | 30 days | Overnight cargo only carrier | Per instructions in Appendix G |

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TABLE 4
QUALITY ASSURANCE OBJECTIVES
FOR FIELD MEASUREMENTS

| <u>Measurement</u> | <u>Matrix</u> | <u>Method</u> | <u>Accuracy</u> | <u>Precision % Standard Deviation</u> | <u>Completeness</u> |
|---|---------------|---------------|-----------------------------|---|---------------------|
| pH | Water | Electrometric | ±0.05 units | ±15% | 95% |
| Specific Conductance | Water | Conductance | ±5.0% of a standard | ±15% | 95% |
| Temperature | Water | Thermometer | ±1.0°C | ±1.0°C | 95% |
| Organic Vapor Analyzer | Air | HNU/OVA/OVM | ±1.0% of the meter scale | ±15% | 95% |
| Water Elevation | Water | Wet Tape | ±0.01 feet | ±15% | 95% |
| Down-Hole Geophysical Logging | Soil | Keck SR3000 | Not Established | Not Established | Not Established |
| CG/O ₂ /H ₂ S Meter | Air | Varies | Not Established | Not Established | Not Established |
| Cyanide Monotox | Air | Varies | Not Established | Not Established | Not Established |

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3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

A diverse mix of knowledge and experience is needed by project personnel to perform the data gathering activities and data evaluations necessary to complete the program. Knowledgeable, efficient and effective project management is the key to the successful completion of the RI/FS study. At the direction of the Region V Remedial Project Manager (RPM), with final authority by the Regional Project Officer (RPO), WW Engineering and Science has overall responsibility for all phases of the RI/FS. WWES will perform the field investigations and prepare the RI and FS reports. The analytical laboratory services for this project will be performed by the CRL and/or an EPA approved CLP Laboratory.

3.1 Management Responsibilities

Operational responsibilities involving execution and direct management of the technical and administrative aspects of this project have been assigned as follows:

- Susan Heston
Acting Regional Project Officer (RPO)
U.S. EPA Region V Site Management Section
- Fred Bartman
Remedial Project Manager (RPM)
U.S. EPA Region V
- Robert Phillips
Program Manager (PM)
WW Engineering and Science
ARCS Program Management Office
- Kathryn Lynnes
Site Project Manager (SPM)
WW Engineering and Science

3.2 Responsibility by Task

During the performance of this project, the U.S. EPA and WWES have specific Quality Assurance (QA) roles to perform. These roles and responsibilities are outlined as follows:

| <u>Task</u> | <u>Responsible Organization/Personnel</u> |
|--|---|
| <u>QA Organization</u> | |
| • Final Review and Approval of RI/FS QAPP | U.S. EPA Region V RPM U.S. EPA Region V QA Officer |
| • QA Program for CLP; RAS/SAS Performance and System Audits for CLP RAS/SAS | U.S. EPA Hdqtrs OERR U.S. EPA Sample Management Office U.S. EPA Region V CRL LSSS U.S. EPA EMSL-Las Vegas, QA Division |
| • QA review and approval of reports, SOPs, and field activities; Auditing of reports, procedures, and activities for identifying and controlling non-conformance for corrective action | WWES's QA Manager |
| • Performance & System Audits of U.S. EPA CRL | Laboratory Scientific Support Section (LSSS), Region V CRL |
| • Approval of QA programs and laboratory test procedures other than CLP Routine Analytical Service (RAS) | U.S. EPA Region V QAO U.S. EPA Region V CRL |

Field Operations

| | |
|------------------------------|-----------------------------|
| • Sample Collection | WWES's Site Project Manager |
| • Field Measurements | U.S. EPA Region V RPM |
| • Oversight of Subcontractor | |

| <u>Task</u> | <u>Responsible Organization/Personnel</u> |
|---------------------|---|
| <u>Laboratories</u> | |

CLP RAS:

| | |
|-------------------------|-----------------------------|
| - Initiation of Request | WWES's Site Project Manager |
|-------------------------|-----------------------------|

- U.S. EPA Region V Contact
- Administration of CLP RAS

U.S. EPA Region V CRL LSSS
U.S. EPA HQ OERR
U.S. EPA Sample Management Office
U.S. EPA EMSL - Las Vegas
U.S. EPA Region V CRL LSSS

- Data Assessment of CLP
RAS including Tentatively
identified compounds

U.S. EPA Region V CRL QC Coordinator
WWES's QA Manager

CLP SAS:

- Initiation of Request
- Preparation of routine SAS
- Contact for CLP
SAS services
- Review & Approval
of CLP SAS

WWES's Site Project Manager

WWES's QA Manager

U.S. EPA Region V CRL LSSS

U.S. EPA Region V CRL LSSS
U.S. EPA Region V Quality Assurance
Office
U.S. EPA Region V RPM

U.S. EPA Region V CRL/Analysis of Residential Well Water Samples:

- Initiation of Request
- Final Data Assessment

WWES's Site Project Manager

U.S. EPA Region V Central Regional
Laboratory (CRL)

In addition to these responsibilities, WWES will evaluate and review all U.S. EPA CRL assessed data and prepare a summary regarding the restrictions and qualifications applied to the laboratory data for use in the RI and FS.

WW Engineering and Science will perform unannounced quality assurance audits of key field activities to assure that standard procedures and the provisions of this QAPP Addendum are being performed. The results of the audits will be provided to the Site Project Manager. The Site Project Manager will initiate any corrective action deemed necessary. Quality Control and Quality Assurance for field data and sample collection and for data interpretations will be assured by establishing a project team having the necessary training and experience. In this regard, WWES has assigned the

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responsibilities shown in Figure 1 for this project. Biographies for personnel shown on this chart are included in Appendix C of the Work Plan.

Figure 1
**QA/QC Functional Responsibility
 Chart for WWES Staff**

Program Quality Assurance
 D. Wallace

Project QA/QC
 K. Lynnes

| Task Description | Quality Control | Quality Assurance |
|---------------------------------------|----------------------|-------------------|
| Hydrogeologic Data Collection | C. VandenBerge | D. Gebben |
| - Geophysics | S. Holn | D. Gebben |
| - Boring/Well Construction | Geologist/Technician | D. Gebben |
| - Soil/Water Sampling | Geologist/Technician | D. Gebben |
| - Hydraulic Conductivity Tests | C. VandenBerge | D. Gebben |
| - Water Level Measurements | C. VandenBerge | D. Gebben |
| Hydrogeologic Interpretation | C. VandenBerge | D. Gebben |
| Analytical | | |
| - Organics | (CRL and/or CLP) | R. Rediske |
| - Inorganic | (CRL and/or CLP) | R. Rediske |
| - SAS | (CRL and/or CLP) | R. Rediske |
| Environmental Assessment | G. Hendrix | R. Rediske |
| Engineering | L. Pugh | R. Berner |
| - RI Data Collection | L. Pugh | R. Berner |
| - RI Data Evaluation | L. Pugh | R. Berner |
| - Alternative Development & Screening | L. Pugh | R. Berner |

4.0 QA OBJECTIVES FOR MEASUREMENT DATA IN TERMS OF PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

4.1 Definitions of Precision, Accuracy, Completeness, Representativeness, and Comparability.

4.1.1 Precision

Precision is defined as a measure of mutual agreement among individual measurements of the sample property.

4.1.2 Accuracy

Accuracy is defined as the degree of agreement of a measurement or average of measurements with an accepted reference or true value. In general, appropriate accuracy goals include using reference materials of highest known purity for calibrations and spiking.

4.1.3 Completeness

Completeness is defined as the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. It is expected that the CLP will provide data meeting QC acceptance criteria for 95% of all samples tested. The CRL and CLP, should provide data that meet all specified QA/QC requirements.

4.1.4 Representativeness

Representativeness is defined as the degree which data accurately and precisely represent a characteristic of a sampling point or environmental condition. All samples collected will be representative of the actual environment. In addition, representative aliquots and subsamples will be withdrawn from these samples for the purpose of analysis.

4.1.5 Comparability

Comparability is defined as the degree of confidence which one set of data can be compared with another. Comparable data will be generated in this project by using units (mg/kg, ug/l, etc.) and methods which are standard for environmental studies. This data will be presented along with the analytical results to compare the quality of the study to those performed in the past or future. In addition, care will be used when discussing data generated by different methods (total phenols vs GC/MS acid fraction, total and dissolved metals, GC vs GC/MS analysis).

Data from these methods may not be comparable, depending on the matrix or compounds analyzed.

4.2 Laboratory Analysis

The ground water samples collected from the private wells at the Skinner Landfill site will be analyzed using the U.S.EPA Central Regional Lab (CRL), or if necessary, through the U.S.EPA Contract Laboratory Program (CLP). Additional matrices including, ground water, soil, lagoon waste, leachate, surface water and sediment will be analyzed using a CLP laboratory. Drinking water parameters and detection limits provided by the CRL are given in Appendix B. The Central Regional Laboratory has "in-house" Standard Operating Procedures from which they comply with when analyzing drinking water samples for inorganics. The CRL SOP's are also contained in abbreviated form in Appendix B.

The QA objectives for the CLP Routine Analytical services (RAS) analyses are to achieve QC criteria stated in the CLP Statement of Work (SOW-7/87), for organic chemical analyses (including volatiles, semi-volatiles, and Pesticides/PCB's), and SOW-7/87 for inorganic chemicals (including metals and cyanide). Appendix B presents the parameters and detection limits provided by the CLP RAS for low and medium level samples of soil and water.

Additional parameters that are not included in the RAS package have been submitted on the CLP Special Analytical Services (SAS) Request forms. The QA objectives for the SAS parameters and the appropriate request forms (defining laboratory protocol) are found in Appendix D.

4.3 Field Measurements

QA objective for field measurements in terms of precision, accuracy, completeness, comparability, and representativeness includes proper operation of the field equipment based on the standard operating procedures included in Appendix E. Specific objectives are given in Table 4. Since the use of spiked samples or surrogates is not part of field measurements, the precision and accuracy objectives are defined as follows:

- The analysis of reference standards (where possible) will be conducted between sampling stations or hourly. The acceptance criteria is given in Table 4.
- Duplicate field measurements will be collected at 10% of all stations. Duplicates must agree within the limits given in Table 4.

TABLE 4
QUALITY ASSURANCE OBJECTIVES
FOR FIELD MEASUREMENTS

| Measurement | Matrix | Method | Accuracy | Precision % Standard Deviation | Completeness |
|---|---------------|---------------|---------------------------|---|---------------------|
| pH | Water | Electrometric | ± 0.05 units | ± 15% | 80% |
| Specific Conductance | Water | Conductance | ± 5.0% of a standard | ± 15% | 80% |
| Temperature | Water | Thermometer | ± 1.0°C | ± 1.0°C | 80% |
| Organic Vapor Analyzer | Air | HNU/OVA/OVM | ± 1.0% of the meter scale | ± 15% | 80% |
| Water Elevation | Water | Wet Tape | ± 0.01 feet | ± 15% | 80% |
| Down-Hole Geophysical Logging | Soil | Keck SR3000 | Not Established | Not Established | Not Established |
| CG/O ₂ /H ₂ S Meter | Air | Varies | Not Established | Not Established | Not Established |
| Cyanide Monotox | Air | Varies | Not Established | Not Established | Not Established |

5.0 FIELD PROCEDURES

5.1 Measurement Procedures

5.1.1 Groundwater Level Measurements

Groundwater levels will be measured by means of the "chalked-steel tape" method. The steel tape will be graduated such that the water level can be recorded to an accuracy of ± 0.01 foot. The static water level will be measured, then confirmed by a second measurement. If the second measurement does not confirm the first measurement, additional measurements will be made until two identical measurements are obtained. All measurements are to be recorded on an appropriate form such as the form shown in Figure 2. If a measurement references a "holding point" other than the top of threads on the well casing, the reference point shall be clearly noted on the form and a diagram provided. All water levels used to predict the direction of groundwater movement will be made in as short a time period as possible and preferably within one day. A minimum of two rounds of ground water level measurements will be collected from all of the monitoring wells.

5.1.2 Elevation and Sample Location Survey

Upon the completion of Phase II sampling activities, the ground surface elevations and horizontal locations of all sampling locations will be measured. For the monitoring wells installed, a ground surface elevation and the elevation of the top of the well casing will be obtained.

Elevations are determined with the use of a standard surveyor's level and stadia rod. A survey circuit is established beginning from a point of known elevation, proceeding to points of unknown elevation and returning to the point of beginning. An elevation survey is of acceptable accuracy if the beginning and final elevation are within ± 0.03 feet. Survey notes must be recorded on a standard form (Figure 3) and these notes must include an accurate description of the point for which an elevation was determined. Ten percent (or a minimum of one per day) of all well elevations will be measured in duplicate to determine the precision of this technique.

5.1.3 In-situ Hydraulic Conductivity Slug Tests

In-situ hydraulic conductivity tests, or slug tests, are single-well aquifer tests in which a known quantity of water is injected into or removed from the well. The water level is monitored as it returns to the original static level.

Rapid measurement of the water level during the test is required for wells in moderately permeable or very permeable formations. This will be accomplished

Water Level and Field Record Form

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Client: _____ Job Description: _____
Project No: _____
Date: _____

[illegible]

SURVEY NOTES

PROJECT _____ DATE _____

PAGE _____

[illegible]

FIGURE 3

through the use of a pressure transducer suspended in the well linked to an electronic data logger.

There are various methods of causing a slug of water to be injected into a well for performing a falling head test. The recommended procedure involves initially applying a constant vacuum to the well. This causes the water level within the well to rise. After the flow into the well is stabilized, the vacuum is released, creating the effect of an instantaneous injection of a slug of water.

The method for performing a rising head test is the same as outlined above, with the exception that a constant pressure is applied to the well.

The calculation of permeability will be made by one of several available equations that use well geometry and the position of the well screen within the aquifer boundaries as variables. Ten percent (or a minimum of one per day) of all in-situ permeability measurements will be performed in duplicate to determine the precision of the technique. Specific instructions for conducting the field test and data analysis is included in Appendix E.

5.1.4 Down-Hole Geophysical Logging

The newly installed deep (bedrock) monitoring wells will be geophysically logged using the following methods; gamma, resistivity (both 0.25 and 2.5 normal), self potential (sp), single-point resistance, caliper, and temperature logging. Measurements will reference ground surface and total depth. Instrument sensitivity settings will be recorded on each log so that the counts per minute for the gamma log scale can be readily determined. A detailed standard operating procedure for this methodology is contained in Appendix E.

5.2 Monitoring Well/Boring Construction

5.2.1 Well Materials

All wells except GW27 will be constructed of Schedule 40, PVC riser pipe and Schedule 40, PVC screen with .010 inch factory machine slots.

- The well casing for the wells will consist of 2 inch inner diameter Schedule 40, PVC. The deep wells will have an additional 4-inch black carbon steel outer casing installed through the unconsolidated sediments to the top of bedrock.
- Casing segments will be threaded and sealed by a neoprene "O" ring or taped with Teflon tape to prevent leakage through the seams.

- The well screen for the wells will be of 2 inch inner diameter and 5 feet in length. The screens will be threaded to the well casing and the joints sealed with a neoprene "O" ring or teflon tape.
- A top and bottom well cap will be threaded to the respective ends. The top well cap will be vented.
- A locking four or six-inch diameter steel protective casing will be installed over the PVC well and cemented in-place.
- GW27, located adjacent to the buried lagoon, will be constructed of type 304 stainless steel riser pipe and type 304 stainless steel, continuous wire wound screen with .010 inch factory installed slots.
- The well casing and screen for GW27 will consist of 2-inch inner diameter type 304 stainless steel.
- The remaining specifications are identical to the PVC wells.

5.2.2 Well Design

Monitoring well installation details are described in Section 2.6.1 of the Sampling Plan. The actual well design will depend upon on-site decisions made by project personnel as an exploration or test well is being constructed. The site project manager will assure that the field supervisory personnel are knowledgeable of the project goals and have sufficient training to supervise the field activities and to make on-site decisions.

5.2.3 Hollow Stem Auger Borings

Subsurface soil samples will be collected during the drilling of all monitoring wells. The soil borings constructed will be installed with 4.25 inch inner diameter hollow stem augers (HSA) using a truck mounted or all-terrain vehicle drilling rig.

Soil samples will be collected using a split spoon (split barrel) coring device which can be lowered to the bottom of the hollow augers and then driven into undisturbed sediments by a large hammer. ASTM D-1586-84 procedures will be followed. Split spoon cores range in length from 1.5 feet to 3 feet and normally obtain a core 2 inches in diameter.

Quality control measures used in soil boring construction by this method include the following:

- A. Sufficient cores are collected to ensure that an accurate log can be made of the materials penetrated. The frequency of coring may be dependent upon

field conditions, and on-site judgment is often exercised by the field supervisor.

- B. Accurate records are maintained during construction to ensure that the depth of recovered samples is accurately known. The core depths are normally recorded to the nearest 0.5 foot.
- C. Core subsamples are selected with due regard to the possibility that the first material which enters the core barrel may represent debris from a shallower zone.
- D. Soil logging procedures will conform to ASTM D 2488-84 procedures.

5.2.4 Well Construction

Wells constructed with the screened portion in the unconsolidated material will be installed following the procedure described below:

- A. Screen depths will be determined from readily available information (i.e., borings or other geologic data).
- B. Auger hole to the desired bottom of screen depth. Procedures will conform to Section 5.2.3.
- C. Lower cleaned casing and screen through the augers and set screen at the desired depth.
- D. Let natural sands collapse around the screen, or place sand pack material from 2 to 5 feet above the top of the screen by pouring clean sand in the annular space between augers and casing.
- E. Install a minimum of one foot of bentonite on top of sand to create a seal.
- F. Pull back augers and backfill annular space from the top of the bentonite seal to two feet below land surface with a slurry of bentonite and cement.
- G. Install locking steel protective casing, seal base of casing in cement grout.
- H. Develop well by a method that results in surging water into and out of the screen until relatively particle free water is produced. The well will not be developed prior to 24 hours after the well has been installed.

5.2.5 Boring/Well Record Form.

All information gathered during the construction of borings or wells will be recorded on a standard log form such as the form shown in Figure 4. The form must include sufficient space to record the information shown in Figure 4 at a minimum.

Page: _____ of _____
Well/Boring No.: _____
Client: _____
Project No.: _____
Permit No.: _____
Date Started _____ Finished _____

| County | Township | Fraction $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ | Section | T | R |
|--------|----------|---|---------|---|---|
|--------|----------|---|---------|---|---|

Location Sketch

[illegible]

| Grouting/Seal | | Material |
|---------------|-------|----------|
| Depth | To | |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

Elevation _____
Casing: _____
Ground: _____
Ref. Pt.: _____

Development: _____

Remarks (Include here, other data available)

Water Level: _____ Ft. Below. _____
Measured On: _____

[illegible]

5.3 Sample Collection Procedures

5.3.1 Sample Containers

All sample containers will be ordered and obtained directly from the Region V Bottle Coordinator or from the WW Engineering & Science authorized bottle requestor. After the samples have been collected, any additional filtering and/or preservation procedures will be conducted in accordance with applicable preparation methods and quality assurance procedures. All sample containers, preservation, shipping, and packaging requirements are summarized in Table 3.

5.3.2 Private Well Sampling

A tap or sampling port will be identified that intersects the water supply system prior to any treatment. The water will be allowed to run for a minimum of fifteen minutes to ensure that the water is representative of the aquifer that it draws from. The samples will be collected directly into the appropriate sample containers.

Sufficient quantities of sample must be collected to conduct the required analysis and quality assurance measurements. The volume required for a duplicate and blank sample is equal to one volume of an investigative sample. A matrix spike organics sample requires three times the normal volume of an investigative sample. A matrix spike inorganics sample requires the normal volume of an investigative sample. The volumes outlined in Table 3 will provide sufficient quantities of sample to perform the required measurements.

Field record forms and/or documentation in a bound field logbook must be completed during the sampling process. The form must contain the information shown in Figure 5 at a minimum.

5.3.3 Soil Sampling

All split spoon samples collected from unsaturated soils will be screened as soon as they are retrieved with an HNu and/or OVA and/or OVM. Soil samples will be retained for chemical analysis from GW26, GW27, GW28, GW29, GW35, and GW38 and from six single soil borings. If the sample emits vapors that exceed two times the ambient, background vapor level or has an odor or appears stained, the core will be sampled for chemical analysis. A minimum of one sample from each borehole designated for sampling for chemical analysis will be retained for chemical analysis. If all samples fail the screening described above, the first sample collected from the water table will be selected for analysis. Quality control provisions for this work are as follows:

- Only "undisturbed" portions of the core will be screened and/or collected for sampling.

- Each split spoon sampler will be decontaminated before use. The procedure will consist of the method described in 5.4.1. An alternate procedure may be used, depending upon the number of coring devices available:
 - Remove excess dirt with stiff brush
 - Steam clean sampler
 - Rinse sampler with distilled water
 - Allow to air dry
- Samples for volatile organic compound analysis will be collected as rapidly as practical after the split spoon is opened. The sample will be placed directly into the sample vials with a stainless steel spatula or trowel.

Sufficient quantities of sample must be collected to conduct the actual analysis and quality assurance measurements. The volume for a duplicate sample and matrix spike sample is equal to one volume of an investigative sample. No blank soil samples will be submitted for analysis. Atmospheric and field water blanks will be prepared and sent with the soil samples. The volumes outlined in Table 3 will provide sufficient quantities of sample to perform the required measurements.

5.3.4 Groundwater Sampling

Sampling will proceed from wells suspected or known to have low contamination levels to wells having high contamination levels. Wells to be sampled will first be purged by removing three times to five times the volume of water contained within the casing and screen with a teflon bailer or positive displacement, submersible pump. The procedure is as follows:

Calculate the volume of water in the well by measuring the depth to water, depth of well, and well diameter to obtain the variables for the equation:

$$V = T r^2 (0.163)$$

Where:

V = Static volume in gallons
T = Thickness of water in the well in feet
r = Inside radius of the well in inches

Discharge water will be collected and measured so that between three and five well volumes are removed prior to sample collection. If the well is completely dewatered during purging, it is permissible to reduce purging to two well

volumes. The VOA sample will not be collected, however, until the well has recovered completely.

Sufficient quantities of sample must be collected to conduct the actual analysis and quality assurance measurements. The volume for a duplicate and field blank sample is equal to one volume of an investigative sample. For RAS water matrix spike samples, three times the normal volume must be collected for volatile organic analysis and three times the normal volume for acid/base neutral extractables and pesticides/PCB's. Two times the normal sample volume will be collected for SAS matrix spike samples.

The volumes outlined in Table 3 will provide sufficient quantities of sample to perform the required measurements. Groundwater will be measured in the field for pH, specific conductivity, and temperature. Field record forms and/or documentation in a bound field logbook must be completed during the sampling process. This form must contain the information shown in Figure 5 at a minimum.

Duplicate samples will be collected at 10% of the sampling locations. Atmospheric blanks will be collected at midday during each day of sampling. One field blank will be prepared for every ten or less investigative samples. One trip blank will accompany each cooler containing VOC samples.

5.3.5 Surface Water and Sediment Sampling

Forty surface water and sediment samples will be collected from ponds and creeks. The sediment retrieved will be transferred into the appropriate sample containers. Every attempt will be made to exclude twigs, rocks, vegetation, and debris from the samples. Samples will be collected so as not to cause cross-contamination; downstream samples in the river will be collected first.

Surface water will be measured for pH, specific conductivity, and temperature. Sufficient quantities of sample must be collected to conduct the analysis and quality assurance measurements. The volumes for duplicate and blank samples are equal to one volume of an investigative sample. For RAS water matrix spike samples, three times the normal volume must be collected for volatile organic analysis and three times the normal volume for acid/base neutral extractables and pesticides/PCB's. Two times the normal sample volume will be collected for SAS matrix spike samples. Sediment samples will be screened with an HNu and/or OVA. For the sediment samples, the analyses will require triple the normal volume to account for the sample analysis, a duplicate, and a spiked sample. No soil blanks will be sent for analysis. Water atmospheric and field blanks will be prepared. The required containers and volume requirements are detailed in Table 3. All pertinent data will be recorded in field notebooks.

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5.3.6 Leachate Sampling

Leachate will be collected from at least one permanent leachate seep along the East Fork of Mill Creek. If additional leachate seeps are found on-site during sampling, they will also be sampled. The leachate will be collected directly into the appropriate sample containers. The leachate will be measured for pH, specific conductivity, and temperature. Sufficient quantities of sample must be collected to conduct the analysis and quality assurance measurements. The volume for a duplicate and blank sample is equal to one volume of an investigative sample. For RAS water matrix spike samples, three times the normal volume must be collected for volatile organic analysis, and two times the normal amount for semi-volatile organic analysis, pesticides/PCB's, and SAS parameters. The normal sample volume will be collected for inorganic analyses. Atmospheric and field blanks will be prepared. The required containers and volume requirements are detailed in Table 3. All pertinent data will be recorded in field note books.

5.3.7 Waste Lagoon Sampling

Waste lagoon samples will be collected from up to 16 sampling locations. The samples will be collected through hollow stem augers using a split spoon sampler. Up to three samples from each location will be retained for chemical analyses. The samples will be immediately transferred into the appropriate sample jars. These samples will be packaged and sent as high hazard samples. Packaging requirements are specified in Appendix F of the QAPP Addendum.

The waste lagoon samples will be screened with an HNu/OVA/or OVM. Sufficient quantities will be collected to perform the analysis and quality assurance measurements. The volume for a duplicate sample is equal to one volume of an investigative sample. For a matrix spike sample, three times the normal volume will be prepared. The required containers and volume requirements are detailed in Table 3. All pertinent data will be recorded in field notebooks.

5.3.8 Field Filtering

Groundwater samples collected for RAS metals analysis, and total phosphorus will all be field filtered. All duplicate and field blank samples analyzed for RAS metals will also be field filtered. The samples will be filtered by one of three methods; pressure filtration, vacuum filtration or by use of a disposable in-line filter. The procedures for all of these methods are described below.

5.3.8.1 Pressure Filtration:

A representative water sample is placed into the filtration apparatus and filtered through a 0.45 um membrane filter by pressurizing the apparatus with compressed nitrogen gas.

Analysis Rate:

Typically, a sufficient sample quantity for laboratory analysis can be field filtered in approximately 30 minutes.

Poorly developed wells may take longer period to filter, depending on sample turbidity and the size of soil or colloidal solids.

Prefilters are useful in filtering difficult samples. A single or series glass fiber prefilters ranging from 0.8 um to 0.65 um may be used above the 0.45 um final filter.

Glass fiber or Teflon(R) filter media should be used. Glass fiber filters should be acid rinsed followed by distilled water rinsed prior to their use for filtering trace materials or nutrient samples.

Materials and Apparatus:

Pressure filtration system

Technical grade nitrogen gas

2-Stage regulator with shut-off valve

2 Liter funnel

2000 ml graduated cylinder - plastic or glass

Final filters- 142 mm/0.45 um cellulose membrane
millipore - H4WP 142 50
nuclepore - 425900 or equivalent
millipore 142 50 (for organic phase
samples)

Prefilters- 124 mm/glass fiber
millipore AP 15 125 50 or AP 15 127 50
nuclepore 211707 (binderless) or 211714
(acrylic binder)

Procedure:

Assemble the filtration apparatus with the necessary final and prefilters in place according to manufacturer's instructions.

Using a funnel, pour the sample to be filtered into the apparatus through the tri-clamp opening. Attach the TC hose adapter at the TC connection and clamp.

Place the sample container below the sample outlet.

Slowly increase pressure on nitrogen tank. When liquid begins to flow from outlet of assembled holder, immediately turn the regulator valve a few turns to lower the pressure. Bleed air from top plate vent valve slowly until pressure gauge reads between 10-15 psi. Close vent valve and (if necessary) readjust regulator valve to set pressure between 10-15 psi. Continue filtration until flow ceases.

Increase inlet pressure at 10 psi increments until flow ceases (do not exceed 75 psi).

Shut off pressure from nitrogen tank regulator and open vent valve gradually on top of filtration apparatus to release pressure from the cylinder.

Repeat the entire procedure if a larger sample volume is needed.

Disassemble apparatus and remove filters and/or prefilters.

Rinse the filtration apparatus, funnel, and graduated cylinder with reagent water and then with water from next sample to be filtered.

NOTE: The first 100 mls of filtrate from each different sample sources should be discarded to help minimize cross contamination between samples.

Quality Control:

During the sample collection, a decon blank will be prepared by filtering water through the filtration apparatus in the same manner as a groundwater sample. This blank will be tested along with the samples.

5.3.8.2 Vacuum Filtration:

A representative water sample is poured into the upper section of a filtration unit and filtered through a 0.45 um membrane filter by means of a vacuum applied to the lower receiving section of the unit.

Analysis Rate:

Typically, a sufficient sample quantity for laboratory analysis can be field filtered in approximately 15 minutes.

Materials and Apparatus:

Disposable filter units having a capacity of 500-1000 ml with a 0.45 um cellulose nitrate membrane filter (nalgene 450-0045, 127-0045, or equivalent).

Hand vacuum pump

1/4" ID tygon tubing (approx. 2 feet)

Procedure:

Open the top of the filtration unit and pour in approximately 25 mls of sample. Attach the hand pump to the hose nozzle on the unit. Slowly apply a slight vacuum to begin filtration. When the 25 ml aliquot is filtered, open the unit and discard the filtrate. Next, reassemble the unit and filter a quantity sufficient to fill the necessary sample bottles.

If the filter should become clogged or impervious, discard the unit and start the process over with a new unit.

Be sure to use a new filter unit for each sample location.

Quality Control:

During the sample collection and filtration process, a periodic decon blank will be generated by filtering reagent grade water through a filtering unit in the same manner as a sample. This blank should be tested for all constituents of interest.

5.3.8.3 In-Line Filtration:

A disposable 0.45 micron filter cartridge will be used for in-line filtering. The device will be attached to the sample pumping device (either the sampling pump or a peristaltic pump) by means of silicone tubing. If the filter is attached directly to the sampling pump, it will be attached immediately after well purging has taken place.

The filtering procedure will proceed as follows:

- The sample will be placed in a 1 liter glass bottle
- The filter cartridge will be attached to the discharge pump by means of silicone tubing
- The discharge tubing and filter will be held upward so that air can be purged from the filter and tubing during the initial pumping
- Fill the appropriate sample bottles with filtered water
- Discard filter and silicone tubing

5.4 QA/QC for the Collection, Storage, and Shipping of Samples

5.4.1 Decontamination Procedures

All tools which come into contact with potentially contaminated water or soil will be decontaminated after each use. The procedure that will be followed includes, but is not limited to:

- Tools will be washed in an alconox or tri-sodium phosphate (TSP) soapy water solution made from clean tap water. A brush may be used to facilitate the process.
- The tools will be rinsed in a clean tap water rinse.
- The tools will be rinsed in a second clean water rinse.
- If the tools have visible oil or dirt that cannot be removed with conventional decontamination techniques, they may be sprayed with hexane. It would be desirable to limit this use to prevent introducing contaminants into the sample.
- Rinse and wash water will be changed frequently.
- The tools will be allowed to air dry before reuse.
- The tools may be wrapped in foil for storage or transportation to prevent re-contamination.

5.4.2 Duplicate Samples

Field quality assurance includes strict adherence to standard procedures for sample collection and the collection of control and duplicate samples to evaluate

variability of results. Approximately 10 percent of the samples delivered to the laboratory will be control and duplicate samples for quality control.

Duplicate samples are collected from one sampling point at the same time the original sample is. Duplicate samples are used to determine the precision of the sampling and analytical procedures. One duplicate sample will be collected for every 10 or fewer investigative samples.

5.4.3 Blank Samples

Three different types of blank samples will be prepared for sampling at the Skinner Landfill site:

Field blanks are used by project personnel to evaluate the effectiveness of equipment cleaning operations. Field blanks will be collected at a rate of one blank per every ten or less investigative samples collected. Procedures for collecting groundwater and surface water field blanks will be as follows; prior to using a pump, bailer or other sampling device, a volume of deionized water is placed in the device (or pumped through it). This water is then collected as the field blank in the appropriate bottles for all the parameters to be analyzed at the site. Procedures for collecting soil and sediment field blanks samples will be as follows; lagoon waste, soil and sediment sampling equipment (augers, shovels, ponar dredges, and split spoons) will be checked for contamination by analyzing the final decon rinse water. Analysis of these samples will be the full list of RAS organics and RAS inorganics and SAS Parameters designated for that particular matrix.

Atmospheric blank samples will be prepared each day to evaluate sample contamination from environmental factors other than the sources being investigated. This blank will be prepared at mid-day (one per day of sampling) at a station location by pouring deionized water into two VOA vials. Atmospheric blank samples will be analyzed for VOA's only.

Trip blank samples will be prepared upon the receipt of the sample containers. Trip blanks will consist of VOA vials filled with deionized water. The vials will be shipped or transported with the empty sample containers to the field. The vials will be kept capped throughout the sampling event. Trip blanks will be shipped in each cooler containing VOC samples during sampling. The trip blanks will be analyzed for VOA's only.

5.4.4 Matrix Spike Samples

Matrix spike samples are collected from one sampling point at the same time the original sample is. One matrix spike sample will be collected for every 20 or less investigative samples.

5.4.5 Chain-of-Custody

To document sample possession from the time of collection until the sample has been received by the analytical laboratory sample custodian, a chain of custody form will be completed by field personnel and accompany every sample shipment. An example of a chain of custody form is shown in Figure 1 of Appendix F. Proper custody of the samples will be documented and changes of sample custody will be documented. As few people as possible will handle the samples. While in the field, it is the field sampler's personal responsibility for the care and custody of the samples until they are transferred or properly dispatched. This chain of custody procedure will be followed during all sampling assignments, regardless of the ultimate use of the sample data. Complete chain-of-custody instructions are in Appendix F.

Each record must contain the following information: signature of collector, date and time of collection, place and address of collection, sample type, signatures of persons involved in the chain of possession, and inclusive dates and times of possession. The field log(s) and final evidence file are also part of the overall chain of custody requirements of this project.

5.4.6 Documentation/Records

Documentation of sampling procedures will be recorded on forms and in bound field survey log books. Individual log books will be issued to field personnel and the following information will be recorded on the title page; field person's name, book number, project name, start date and end date.

Entries into the log book will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel and the purpose of their visit will be recorded in the field log book.

Measurements made and sample collected will be recorded. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the station shall be recorded. The number of the photographs taken of the station, if any, will also be noted. All equipment used to make measurements will be identified.

It is the responsibility of the field sampler to properly identify the exact location of the sample taken; the date upon which it was obtained; the type of sample;

whether or not a preservative has been used and if so what type; the name of the sampler; the site's name; and the respective project number. This information is to be documented in the field sampling log of the individual and/or site log book. This same information is then placed on the sample identification tag, which in turn is affixed to the sample container. An example of the Field Sample Identification Tag is shown in Figure 9 of Appendix F. All sample tags will be filled out with an indelible ink pen to prevent illegible sample information. If the field sampler determines that additional information is pertinent to the sample being taken, such data can be recorded in the log book. Complete documentation procedures are discussed in Appendix F.

5.4.7 Packaging/Shipping

Based upon the sampling and analyses conducted to date, it is anticipated that the samples collected during the Phase II RI will be low, medium, and high hazard. Samples collected from the waste lagoon would be considered high hazard samples. The U.S. EPA and U.S. Department of Transportation have agreed that low concentration/environmental samples, including those chemically preserved need only to be packaged to prevent breakage and leakage during transport. Medium and high hazard samples will be packaged individually in new, empty paint cans and a Shipper's Declaration of Dangerous Goods will be attached to the shipping cooler. Detailed instructions for completing CLP paperwork and shipping protocol for low, medium and high hazard samples are included in Appendix F.

6.0 SAMPLE CUSTODY PROCEDURES

Sample custody protocols for this project will be implemented in accordance with the procedures detailed in NEIC Policies and Procedures, EPA-3301/9-78-001-R, revised in June, 1985. The specific procedures for sample custody are included in Appendix G. An internal CRL custody protocol has been developed for the handling of samples shipped to the Central Regional Laboratory. The specifics of this protocol are also included in Appendix G.

7.0 ANALYTICAL PROCEDURES

Private well samples will be analyzed by the Central Regional Lab (CRL) or using an SAS of the CLP for drinking water analyses and detection limits. Groundwater, lagoon waste, soil, leachate, surface water and sediment will be analyzed using RAS or SAS of the CLP. Initial field measurements will also be collected from the samples. Quality assurance criteria for the analyses to be performed are summarized below and are described in detail in the reference cited.

| <u>QA Criteria</u> | <u>CRL Appendix</u> | <u>RAS</u> | <u>SAS Appendix</u> | <u>Field Measure Appendix</u> |
|--|-------------------------|------------|-------------------------|---------------------------------------|
| Analytical Procedures | B | PD | D | E |
| Calibration Procedures | B | PD | D | E |
| Internal QC | B | PD | D | E |
| Data Reduction, Validation and Reporting | B | PD | D | E |
| Performance/ System Audit | B | PD | D | E |
| Assessment of Data, Accuracy, and Precision | B | PD | D | E |
| Corrective Action | B | PD | D | E |

PD Predetermined in CLP, SOW-7/87 for organic chemical analyses and for metals and cyanide.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

8.1 CRL Analytical Services

All private water samples will be analyzed for organic and inorganic drinking water parameters by the Central Regional Lab (CRL) or under an SAS request at a CLP Laboratory. The CRL has requested that the SAS option be available due to increased demands on their analytical laboratory. It is anticipated that WW Engineering and Science will know which laboratory the private wells will be analyzed at only one week prior to sampling. A list of drinking water parameters is included in Appendix B.

8.2 CLP Routine Analytical Services

Ground water, leachate, surface water, sediment and soil samples will be analyzed using the target compound list (organics) and the target analyte list (inorganics) by the CLP. Lagoon waste samples will be sampled for high hazard organics and inorganics using the most recent high hazard Statement of Work. All testing and analysis will conform to the protocol established in the User's Guide to the U.S. EPA Contract Laboratory Program and to those specified in SOW-7/87 for RAS organics and RAS inorganics for metals and cyanide. A list of RAS parameters is included in Appendix C.

8.3 CLP Special Analytical Services (SAS)

All of the media sampled will also be analyzed for SAS parameters through the CLP. The rationale for the additional analyses is presented in Table 2. The SAS analyses that will be performed is presented below:

- Private Wells - Additional pesticides, chloride, sulfate, acidity, alkalinity, pH, and nitrate/nitrite.
- Ground water and Leachate - Additional pesticides, chloride, acidity, alkalinity, pH, nitrate/nitrite, BOD, COD, TKN, TOC, ammonia, and total phosphorus.
- Surface Water - Sulfate, chloride, nitrate/nitrite, alkalinity, pH, acidity, TDS, TSS, and total phosphorus.
- Soil - Additional pesticides, TOC and dioxin.
- Sediment - Additional pesticides, and TOC.
- Waste Lagoon - Additional pesticides, dioxin and incineration parameters including carbon, hydrogen, sulfur, oxygen, nitrogen, moisture content, ash content, and heating value.

If the CRL is unable to provide low detection organic and inorganic analyses for the private wells, the samples will be analyzed by the CLP using SAS protocol for organic

and inorganic drinking water parameters. Analytical and calibration procedures for these analyses are referenced on the Special Analytical Services--Regional Request Forms contained in Appendix D

8.4 Field Procedures

Private well samples, groundwater monitoring well samples, leachate samples, and surface water samples will be analyzed in the field by WWES personnel for pH, specific conductance, and temperature. HNu and/or OVA and/or OVM screening will be performed on the lagoon waste, soil and sediment samples collected. Operations of all of the instruments will be in accordance with the procedures described in the standard operating procedures included in Appendix E. All field manuals will be available in the on-site trailer.

9.0 INTERNAL QUALITY CONTROL

9.1 CRL Analytical Services

Internal quality control procedures for private water samples will follow in-house CRL guidelines. In order to examine for any sample contamination resulting from field sampling or handling and to check data precision, field duplicates and blanks will be collected and analyzed.

9.2 CLP - RAS

Internal quality control protocol for ground water, leachate, surface water, sediment and soil samples will follow the procedures identified by the CLP in the SOW-7/87 for RAS organics and RAS inorganics for metals and cyanide. Field Blanks, atmospheric blanks, and trip blanks and duplicates will be collected to determine if samples have become contaminated during the sampling and handling process.

9.3 CLP - SAS

Internal quality control procedures for the CLP, SAS analyses are identified in Appendix D. Field blanks and duplicates will be collected to determine if samples have become contaminated during the sampling and handling process.

9.4 Field Procedures

All field analyses and miscellaneous data collection efforts will be performed on-site during the RI field investigation. Use of field meters and equipment will be by direction of the Project Geologist. The Project Geologist will ensure that the instrument has been properly calibrated, is in good working condition and that the person using the equipment has been trained in its use. Equipment calibration and maintenance is summarized in Table 5. Complete maintenance and calibration records will be maintained for all field equipment used on this project.

TABLE 5**FIELD EQUIPMENT CALIBRATION AND MAINTENANCE PROCEDURES**

| Equipment Type (Make/Model) | <u>Calibration Method</u> | <u>Calibration Frequency</u> | <u>Maintenance Schedule</u> |
|--|---|---|--|
| pH Meter | Unit calibrated by testing probe in a known pH solution | The unit is calibrated prior to every use | Unit is sent to factory for service as needed |
| Specific Conductance Meter | Factory calibrated, no customer calibration possible | Equipment calibration is done only one time unless new components are added | Equipment is returned to manufacturer for repair and recalibration as needed |
| HNu/101 PID | A benzene based calibration span gas is used to calibrate the instrument according to the manufacturing specifications | The unit is calibrated once each day. | A preventative maintenance program is adhered to which includes weekly instrument inspection and repairs on an as-needed basis. |
| Hermit SE 1000B | Aside from minor system checks and readout verification, no actual customer calibration is possible | System check made prior to every use. Recalibration of unit requires return to manufacturers | No periodic maintenance required. If repair needed, unit is returned to manufacturer. |

TABLE 5 (cont)

FIELD EQUIPMENT CALIBRATION AND MAINTENANCE PROCEDURES

| Equipment Type (Make/Model) | <u>Calibration Method</u> | <u>Calibration Frequency</u> | <u>Maintenance Schedule</u> |
|---|--|--|---|
| Geophysical Loggers Keck SR3000, EM-39 | Factory Calibration, no customer calibration possible | Equipment calibration is done only one time | Equipment is returned to manufacturer as needed. |
| Wetted Tape | No customer calibration needed | Visually inspected once a day for damage | Replace if necessary |

10.0 DATA REDUCTION, VALIDATION AND REPORTING

10.1 CRL, CLP-RAS, and CLP-SAS Analytical Services

The Laboratory Scientific Support Section (LSSS) of the CRL will perform data validation to assess the accuracy of data reporting and the acceptability of data reduction. A comprehensive review of the data handling standards will ensure the integrity of raw data and provide for a complete sample handling paper trail from the initial collection, chain-of-custody through data reduction. The resultant data base will be evaluated for numerical reasonableness and acceptability. Extreme values or outliers will be eliminated. The procedures of data validation will ensure that the analytical data will be defensible for use as evidence in subsequent legal proceedings. The final RI report will include the raw analytical data as an appendix to that report.

All data reduction activities will be fully documented such that reviews to monitor the validity of the reduction process can be easily and accurately made. Data reduction will consist of the procedures necessary to transform raw instrument data to usable project data. Validation will consist of reviewing the daily calibration, precision, and accuracy of the data. Personnel responsible for work performed on the data will date and sign (or initial) the deliverable package so that any problems with the data reduction process can be easily resolved.

The performance of tasks and results will be fully documented. Data packages will be reviewed for completeness and data validation efforts will be noted each time data are recorded, calculated or transcribed.

10.2 Field Procedures

Upon completion of each task, a memorandum describing the methods used, raw data sheets, and instrument outputs will be prepared. For the final RI report, summarized raw data will be included as an Appendix. WWES will perform quality assurance reviews to assess the quality of the data.

11.0 PERFORMANCE AND SYSTEM AUDITS

11.1 CRL, CLP-RAS and CLP-SAS Analytical Services

The Region V Quality Assurance Section is responsible for the performance and system audits for the CRL.

The Support Services Branch, Office of Emergency Remedial Response (OERR), EPA; and the Environmental Monitoring and Support Laboratory (EMSL)--Las Vegas, EPA are both responsible for performance and system audits for CLP (RAS). The audits are described by the CLP in the SOW-7/87 for RAS organics and SOW-7/87 RAS inorganics for metals and cyanide.

Appendix D identifies the system audits and required performance limits that are required for each SAS analysis performed by the CLP.

11.2 Field Procedures

The field instruments used during the RI field investigation will be regularly calibrated (if applicable) per instructions in the operating manuals. Calibration provisions are summarized in Table 5.

12.0 ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

12.1 CRL, CLP-RAS and CLP-SAS Analytical Services

The Laboratory Scientific Support Section (LSSS) of the CRL is responsible for CRL data assessment. Data completeness will be checked by WWES and the SMO. Accuracy and precision definitions for analyses performed by the CRL are established in the Standard Operating Procedures contained in Appendix C in abbreviated form.

The Laboratory Scientific Support Section (LSSS) of the CRL is responsible for RAS data assessment. Data completeness will be checked by WWES and the SMO. The accuracy and precision definitions for RAS analyses performed by the CLP are listed in SOW-7/87.

The Laboratory Scientific Support Section (LSSS) of the CRL is responsible for SAS data assessment. Data completeness will be checked by WWES and the SMO. Appendix D defines the accuracy and precision goals that are required for each SAS analyses performed by the CLP.

12.2 Field Procedures

WWES will evaluate the methods used and data collection to assure that QA/QC objectives have been met. Since most of the instruments produce data which are qualitative in character, no quantitative goals have been identified.

13.0 CORRECTIVE ACTION

13.1 Laboratory Analytical Services

The SPM will be responsible for implementing any corrective action deemed necessary if quality control audits result in detection of unacceptable conditions of data. The corrective action initiated may include;

- If holding times have not been exceeded, reanalyze samples.
- Resample and analyze.
- Assess and amend sampling and analytical procedures.
- Accept the data as is, acknowledge the implications of data use.

13.2 Field Procedures

If repeatable measurements can not be met to the satisfaction of the operator, the instruments will be recalibrated. If the instrument again fails to produce repeatable data, the Site Project Manager will be notified and an appropriate correction action implemented. Corrective action may consist of replacing the instrument with another instrument or repairing the instrument. The Site Project Manager may halt field work until a properly functioning instrument is available.

14.0 PREVENTATIVE MAINTENANCE

All field monitoring and analytical equipment shall be maintained in accordance with the manufacturer's recommended schedules and procedures. Standard operating procedures for the field equipment are included in the QAPP Addendum in Appendix E. In addition, field manuals will be available on-site during the remedial investigation activities. The Project Geologist will ensure that each person using field equipment will be familiar with the appropriate manuals or operating instructions. All maintenance activities will be documented by field personnel. All calibrating will be performed on a routine basis and as otherwise required. Routine inspection of all equipment is intended to identify problems requiring maintenance before they cause a major disruption of the field monitoring activities.

15.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

WWES will perform unannounced task audits to evaluate the quality assurance performance of said tasks. It is anticipated that a brief summary of each audit will be provided in the monthly progress report. WWES laboratory staff will summarize the CRL quality assurance laboratory reviews in a form that is intended to be more "user-friendly". This will be used by WWES staff during the data review and preparation of the RI report. The laboratory summary will also be included in the respective monthly report.

The final RI report and FS report will contain a separate QA section that summarizes all of the data quality information collected during the project.

16.0 PERMANENT STORAGE OF LABORATORY AND FIELD RECORDS

In accordance with the ARCS contract, WWES Engineering and Science will store all field records generated during the Skinner Landfill site Phase II RI/FS study. These records will be temporarily held by WWES and readied for transfer to the EPA Remedial Project Manager or Project Officer upon request. All original laboratory data reports along with QA/QC data will be retained by the Central Regional Laboratory (CRL). Eventually all documents concerning the Skinner Landfill site RI/FS study will be incorporated into the administrative record.

APPENDIX A
SAMPLING PLAN

Sampling Plan

for the . . .

Remedial Investigation and Feasibility Study

of the . . .

Skinner Landfill Site West Chester, Ohio

prepared for . . .

U.S. Environmental Protection Agency Region V Chicago, Illinois

EPA Contract No. 68-W8-0079
EPA Work Assignment No. 04-5L73
WW Engineering & Science Project No. 04003
September, 1989

SKINNER LANDFILL SAMPLING PLAN

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SAMPLING PLAN

1.0 INTRODUCTION

This Sampling Plan, in conjunction with the Quality Assurance Project Plan (QAPP) Addendum and the Health and Safety Plan (H&S Plan), defines the level of effort necessary to complete the site investigation portion of the Phase II Remedial Investigation (RI) program.

The scope of work is based on a review of existing information available on the Skinner Landfill site. Previous data collected at the site to date is contained in Attachment 1 of this plan. The Sampling Plan is designed to address the needs of the data users and data quality objectives (DQO's) identified in the QAPP Addendum. Phase II of the Remedial Investigation (RI) will concentrate on characterizing contamination in the buried lagoon, the active landfill, and the ponds. Additional samples will be collected to establish background levels and assess potential contaminant migration off-site. A sampling summary of the projected Phase II, RI activities is presented in Table 1.

1.1 OBJECTIVES

The primary objectives of the Phase II Sampling Plan are to discuss the rationale used to select the sample locations; identify the number of samples to be collected; and specify the guidelines to be followed for sample collection and preservation.

The Sampling Plan discusses in detail the procedures to be followed by investigators for installing soil borings and monitoring wells; collecting lagoon waste, ground water, soil, sediment, leachate and surface water samples; and performing borehole geophysical investigations and hydraulic conductivity tests.

1.2 BACKGROUND

The Skinner Landfill is an active demolition debris landfill located north of the Village of West Chester, Ohio. The landfill is located in Section 22, Township 3 North, Range 2 West of Butler County as shown in Figure 1.

In December 1982, the Skinner Landfill was added to the United States Environmental Protection Agency (U.S. EPA) National Priorities List (NPL) by the U.S.EPA. Remedial Investigation activities began in September, 1984 when the site was awarded to Roy F. Weston, Inc. (WESTON) under the Remedial Engineering Management (REM) II

TABLE 1
SUMMARY OF PHASE II SAMPLING AND ANALYSIS PLAN
SKINNER LANDFILL

| <u>Matrix Sampled</u> | <u>Number of Investigative Samples¹</u> | <u>EPA RAS² Organics</u> | <u>EPA RAS Inorganics</u> | <u>EPA SAS³ Parameters</u> |
|-----------------------------|--|-------------------------------------|---------------------------|---------------------------------------|
| Private Wells(ground water) | 10-20 | X (CRL) ⁴ | X (CRL) | X |
| Ground Water | 31 | X | X | X |
| Soil | 65 | X | X | |
| Lagoon Waste | 48 | X | X | X |
| Surface Water | 40 | X | X | X |
| Sediment | 40 | X | X | X |
| Leachate Seeps | 1-3 | X | X | X |

- 1) Duplicates and Blanks will be collected at a frequency of 10% or less: Matrix Spikes will be collected at a frequency of 20% or less
- 2) RAS - Routine Analytical Services, Contract Laboratory Program (CLP)
- 3) SAS - Special Analytical Services, Contract Laboratory Program (CLP)
- 4) CRL - Central Regional Lab
- 5) Detailed Matrix Sampling summaries are provided in Tables 1 of the Quality Assurance Project Plan Addendum

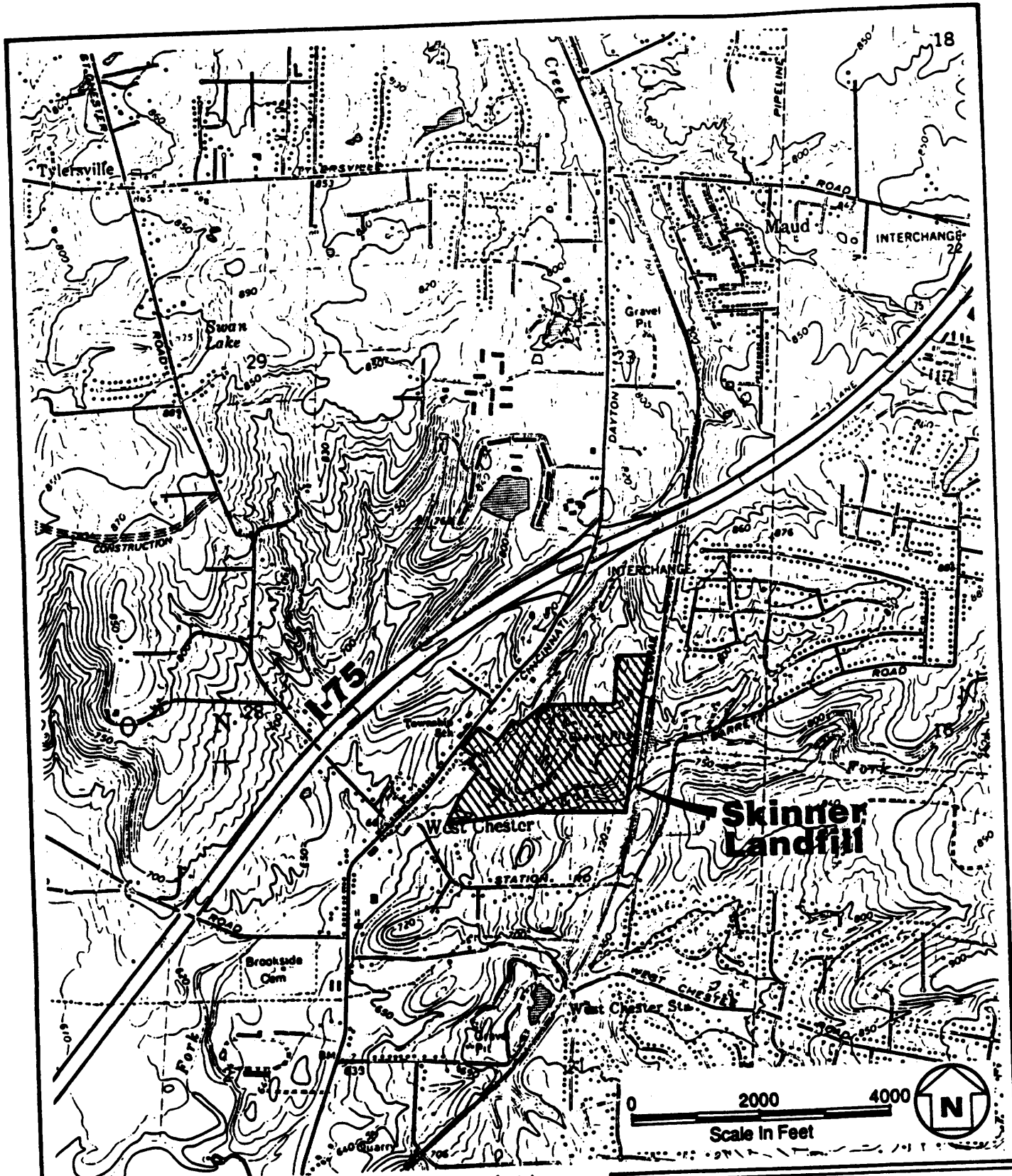


Figure 1
Site Location Map
Skinner Landfill
 West Chester, Ohio

February, 1989

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contract. Phase I field activities under WESTON resulted in the issuance of a Preliminary Phase I RI/FS Report in December 1988. RI/FS work at the Skinner Landfill site has subsequently been transferred to WW Engineering and Science (WWES) under the Alternative Remedial Contracting Strategy (ARCS) contract. The work assignment was received by WWES on January 4, 1989. A more detailed discussion of the site background can be found in Section 1.1 of the Work Plan.

1.3 EVALUATION OF EXISTING DATA AND DATA NEEDS

Although several studies have been performed on and around the Skinner Landfill site (see Section 1.1.4 of the Work Plan) the quantity and quality of data collected does not adequately characterize the existing and potential nature and extent of contamination on and off the site. Additional data is required to thoroughly evaluate potential risks to human health and the environment and to evaluate possible remediation alternatives.

This Sampling Plan is designed to provide this additional information. The scope of this investigation is based on the following factors:

- The contaminants present in the buried waste lagoon have not been adequately characterized.
- Existing data indicates that ground water in a shallow sand and gravel aquifer downgradient from the Skinner Landfill site is contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds, and inorganic compounds. The ground water is a source of drinking water for private wells. It is not known at this time, if private water supplies have been impacted by contaminants from the site.
- The analysis of sediment collected downstream of the Skinner Landfill site and adjacent soils detected elevated concentrations of several semi-volatile organic compounds.
- Ground water contamination in the bedrock aquifer beneath the site has not been fully identified.
- The extent of hydraulic connection between the bedrock aquifer system and the unconsolidated aquifer below the site has not been fully established.

- Groundwater flow in the bedrock has not been adequately characterized.

The following sampling and field testing activities are proposed for the Phase II stage of the Remedial Investigation. An estimated 10 to 20 private ground water wells will be sampled in the vicinity of the site. An estimated 5 shallow, 3 intermediate, and 7 deep monitoring wells will be installed. Soil samples will be collected for chemical analysis during the drilling of six new monitoring wells. In addition, six additional soil borings will be drilled and soil collected during drilling will be collected for chemical analysis. Three hand auger borings will be performed for the collection of soil samples. Ground water samples will be collected from the 16 existing operable monitoring wells and the 15 newly installed wells, including the one replacement well. At least one existing leachate seep will be sampled and if other leachate seeps are observed during field work, they too, will also be sampled. An estimated 40 surface water and 40 sediment samples will be collected. An estimated sixteen boreholes will be drilled into the buried lagoon in an attempt to define the lateral and vertical boundaries of the lagoon. An estimated 48 waste samples will be collected for chemical analysis. In addition, blank, duplicate and matrix-spike samples will be collected for quality assurance/quality control (QA/QC) purposes. Hydraulic conductivity tests will be performed on all of the newly installed wells and selected existing wells. The 7 newly installed deep wells will be geophysically logged.

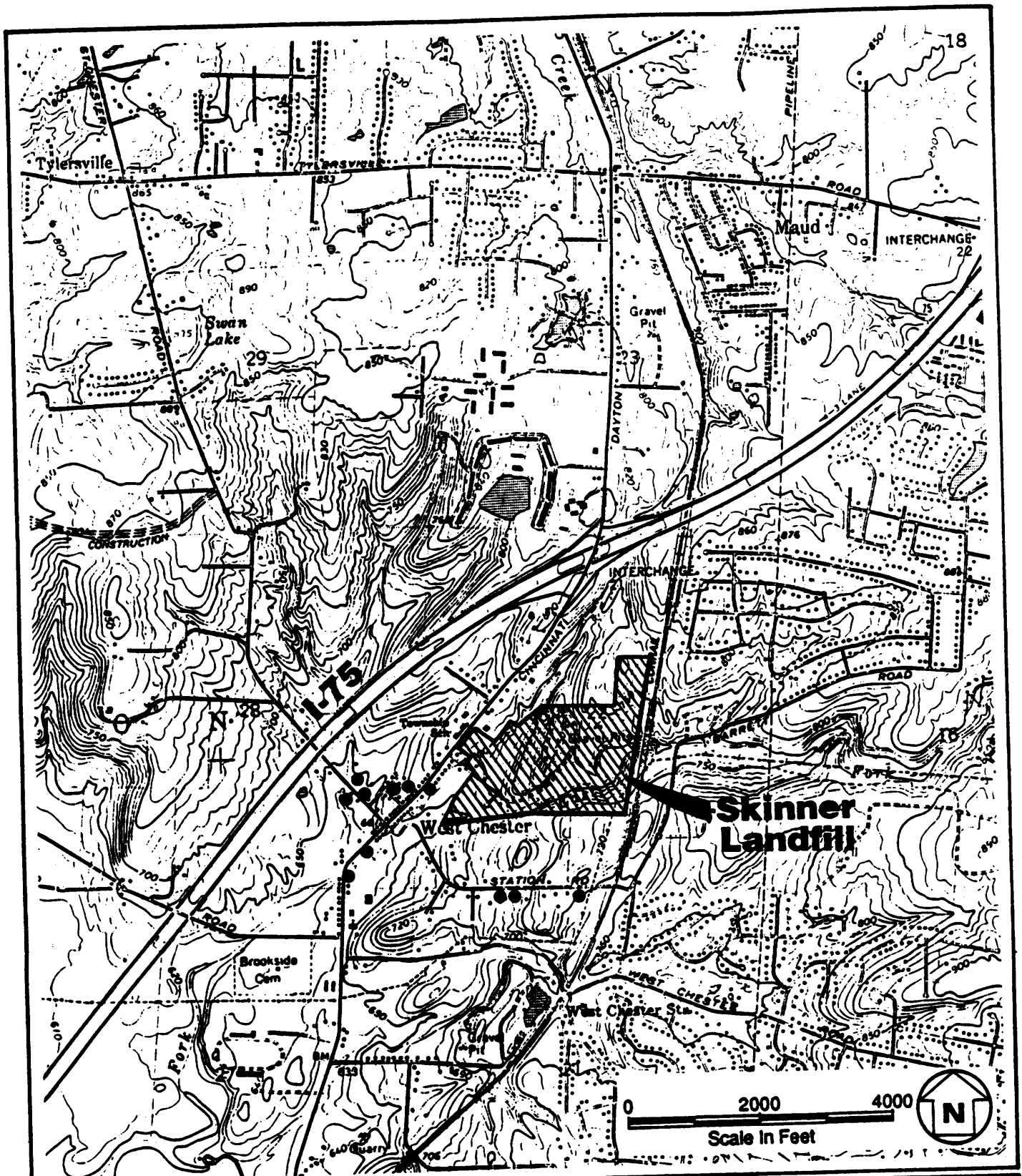
2.0 PROPOSED FIELD INVESTIGATION

2.1 PRIVATE WELL SAMPLES

2.1.1 Sample Locations and Analyses

Ten to twenty private wells that are located within a one mile radius of the Skinner Landfill will be sampled. Well records in the Phase I RI report and field notes collected in April 1986 have been used to tentatively identify potential private wells as shown in Figure 2. In addition, there are reportedly four potable wells on-site that are used for drinking water. These will attempt to be sampled; however, based on previous communication with the land owners, it may be difficult to obtain their permission to sample these wells.

The private well samples will be analyzed for the parameters summarized in Table 1 of the QAPP Addendum. In addition to the 10 to 20 investigative samples, duplicate and blank samples will also be collected. Deionized water blanks will be collected at a rate



Map copied in part from USGS Glendale Quadrangle (7.5 minute)

Figure 2
Private Well
Sampling Locations
Skinner Landfill
West Chester, Ohio

February, 1989

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of 1 per day. The duplicate and blank samples will be preserved using the same procedures as the investigative samples.

All of the private well samples will be sent to the Central Regional Lab (CRL) or a Contract Laboratory Program (CLP) Laboratory under a Special Analytical Services (SAS) request for drinking water analysis of organic parameters including volatiles, acid and base/neutral extractables, pesticides/PCB's, and unfiltered inorganics. In addition, nitrate-nitrite, sulfate, chloride, alkalinity, pH, acidity, and additional pesticides will be sent to a CLP laboratory for analysis under an SAS request.

2.1.2. Sampling Equipment and Procedures

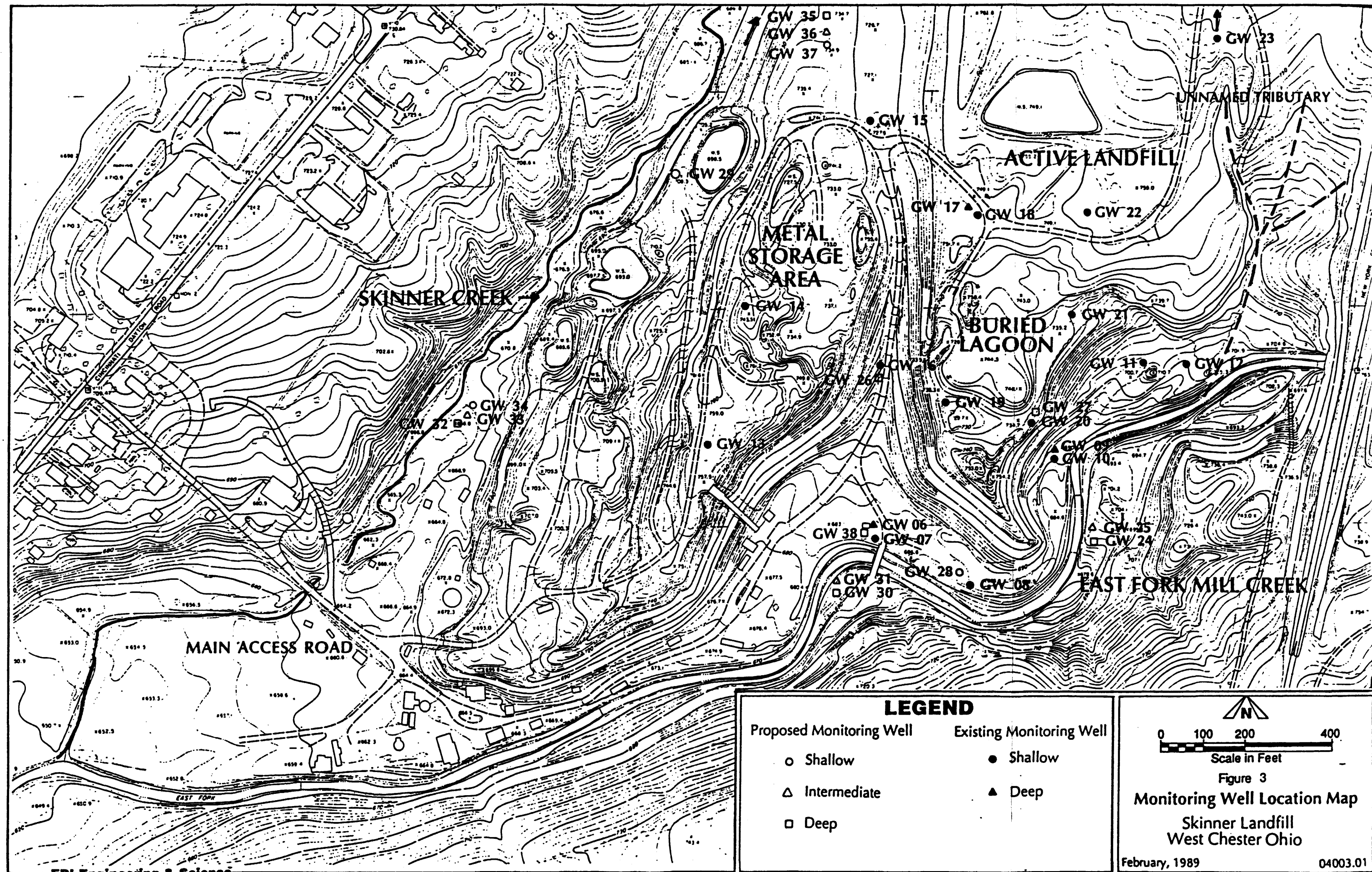
U.S. EPA, Ohio EPA, and/or Butler County will assist WWES in obtaining permission to sample and schedule the collection of samples. The samples will be collected directly from a tap that intercepts the water system prior to any treatment, such as a water softening unit. The water will be allowed to run for at least 15 minutes to ensure that the pipes have been adequately flushed. The rate of flow will be monitored and recorded. The water samples will be collected directly from the tap into the appropriate sample bottles. Care will be taken when collecting the VOC samples by slowly placing the water into the vial to reduce splashing and volatilization.

Field measurements, including pH, specific conductivity and temperature, for the water samples that will be recorded in a logbook or on field data sheets. Additional data that will be noted include; color of sample, any odors, the amount of time the pipes were flushed, and details concerning well system, piping and proximity to the septic system.

2.2 MONITORING WELL INSTALLATION

2.2.1 Monitoring Well Locations

Fifteen ground water monitoring wells, (5 shallow, 3 intermediate, and 7 deep), will be installed at the tentative locations shown in Figure 3. Location accessibility, existing hydrogeologic data, and water quality analyses will be used to optimize well placement. Two well nests installed south of the East Fork of Mill Creek will be composed of a deep well and an intermediate well. Two well nests (installed in the Skinner Creek drainage basin) will be composed of a shallow well, an intermediate well and a deep well. Companion deep wells will be installed adjacent to GW16, GW20, and GW38. An additional well will be installed to replace GW08 which is reportedly dry.



A shallow well (GW29) will be installed between Skinner Creek and the most northern pond adjacent to the creek.

The shallow wells will be screened in the sand and gravel aquifer where this formation is saturated. The intermediate wells will be installed such that the screen is set on the top of the bedrock. If the depth of the bedrock is less than twenty feet below the water table only the shallow well will be installed. The deep wells will be installed as bedrock wells. The approximate installation depths for the Phase II monitoring wells are summarized in Table 2 and were developed based upon a review of the Phase I cross sections, boring logs and well construction summaries contained in the Phase I Interim RI Report.

Construction will begin at the seven locations selected for the deep bedrock wells. It is proposed that the deep wells be constructed and geophysically logged first and the resulting data used to select the depths of the remaining wells.

One well nest will be installed upgradient of the site along the Skinner Creek Floodplain to serve as background monitoring wells on the west side of the ground water divide. Existing monitoring well, GW23, will serve as the background monitoring well for those wells located on the east side of the ground water divide. These wells may be located on privately owned property and U.S. EPA assistance will be sought in obtaining permission to construct these wells.

2.2.2 Monitoring Well Installation Procedures

All drilling and well installation will be supervised and documented by qualified WWES personnel. All drilling equipment, including the drilling rig, augers, tools, and other necessary materials will be steam cleaned between each borehole. A more detailed discussion pertaining to decontamination is contained in the QAPP Addendum. All borehole drilling and well construction details will be recorded by WWES personnel in a bound field logbook or on boring log and well installation data sheets.

The deep boreholes will be initially advanced with 6 1/4 inch inner diameter (ID) hollow stem augers (HSA) until the augers reach the top of the bedrock. The deep wells will be sampled using a 2 or 3 foot split spoon sampler. If the bedrock is greater than 20 feet from ground surface, four inch black carbon steel casing will be cemented in place to the top of the bedrock. This will eliminate the possibility of cross-contamination of the bedrock from the unconsolidated sediments. The drilling will continue, after the cement

TABLE 2
PHASE II MONITORING WELL SPECIFICATIONS
SKINNER LANDFILL

| Monitoring Well ----- | Well Interval ----- | Approximate Depth ----- | Screened Formation ----- | Rationale ----- |
|--------------------------|------------------------|----------------------------|-----------------------------------|--|
| GW24 | Deep | 40 | Bedrock Aquifer | Assess contaminant movement under creek in bedrock, evaluate fracture flow in bedrock, and determine vertical gradient and direction of groundwater flow. |
| GW25 | Shallow | 15 | Top of Silty Clay | |
| GW26 | Deep | 50 | Bedrock Aquifer | Define vertical extent of contamination. |
| GW27 | Deep | 75 | Bedrock Aquifer | Define vertical extent of contamination. Define water levels and direction of groundwater flow away from the buried lagoon. |
| GW28 | Shallow | 18 | Sand and Gravel Aquifer | Replace GW08 |
| GW29 | Shallow | 25 | Sand and Gravel Aquifer | Determine if contamination is emanating from northern most pond. |
| GW30 | Deep | 55 | Bedrock Aquifer | Assess contaminant movement under creek in bedrock, evaluate fracture flow in bedrock, and determine vertical gradient and direction of groundwater flow. |
| GW31 | Intermediate | 35 | Bottom of Sand and Gravel Aquifer | |
| GW32 | Deep | 70 | Bedrock Aquifer | Define the extent of contamination downgradient of potential source areas. |
| GW33 | Intermediate | 50 | Bottom of Sand and Gravel Aquifer | Assess contaminant movement under creek in bedrock, evaluate fracture flow in bedrock, and determine vertical gradient and direction of groundwater flow. |
| GW34 | Shallow | 15 | Sand and Gravel Aquifer | |
| GW35 | Deep | 75 | Bedrock Aquifer | Establish background levels for unconsolidated and bedrock aquifers. |
| GW36 | Intermediate | 55 | Bottom of Sand and Gravel Aquifer | Assess groundwater movement through bedrock, evaluate fracture flow in bedrock, and determine vertical gradient and direction of groundwater flow. |
| GW37 | Shallow | 15 | Sand and Gravel Aquifer | |
| GW38 | Deep | 65 | Bedrock Aquifer | Define the extent of contamination downgradient of potential source areas. Assess contaminant movement in bedrock, evaluate fracture flow in bedrock, and determine vertical gradient and direction of groundwater flow. |

has set, using rotary wash drilling techniques and clean water as a lubricant. If clean water is unable to maintain circulation, mud will be used and clean water will be circulated to flush the mud out of the hole once the hole reaches the desired total depth. The borehole will penetrate a minimum of 20 feet into competent bedrock to allow a screen to be set and the grout above the screen to plug any fractures that exist.

The shallow and intermediate boreholes will be advanced using 4.25 inch inner-diameter (ID) HSA. Only single wells where no deep well exists will be sampled with a 2 or 3 foot split spoon sampler.

The monitoring well adjacent to the buried lagoon (GW27) will be constructed of stainless steel casing and screen to prevent the decay of well materials by VOCs. All casings and screen will be flush threaded and sealed with Teflon tape to prevent leakage between connections. The screens will be five feet long and be constructed of 2 inch continuous wound wire (CWW) stainless steel with factory installed 0.010 inch slots. Welded caps will be placed on the bottom of the screens. Threaded or slip on caps will be installed on the top of the well. All materials will be steam cleaned to the satisfaction of WWES personnel.

All other monitoring wells will be constructed using 2-inch, Schedule 40 PVC casing and screens with flush threads. For the deep wells, 2-inch, Schedule 40 PVC will be placed inside the 4-inch casing and the annulus sealed with a "K-packer" and bentonite. Neoprene seals will be installed between sections of casing to eliminate leakage at the threads. The screens will be five feet in length and be constructed of 2 inch, Schedule 40 PVC with 0.010-inch factory installed slots. Threaded PVC caps will be installed at the bottom and at the top of the well. Prior to installation of each well, all well materials will be steam cleaned to the satisfaction of WWES personnel.

A sand pack of natural sand and/or medium-grained silica sand shall extend to at least 2 feet and not more than 5 feet above the top of the well screen. A minimum amount of development will occur to insure the sand settles around the screen. A 3 foot bentonite seal will be installed using bentonite pellets or a bentonite slurry that will be tremmied to the top of the sand pack to ensure that a competent seal is in place. A pure bentonite grout slurry will be tremmied from the bentonite seal to approximately three feet below ground surface to ensure that the annular space between the well and borehole has been completely sealed. If necessary a flexible hose for grouting will be temporarily secured to the casing as the well is installed.

A locking, steel, protective casing will be installed using concrete. A concrete apron at ground surface will be installed sloping away from the protective casing. Three bumper posts may be installed if the well(s) appear to be in danger of being damaged. All borehole drilling and well construction details will be recorded by WWES personnel in a bound field logbook or on boring log and well installation data sheets.

2.2.3 Monitoring Well Development

All of the newly installed monitoring wells will be developed no earlier than 24 hours after installation. Well development will be performed by surging and pumping water back and forth through the well screen. The wells will be developed until three to five well volumes have been evacuated and pH and specific conductivity measurements have stabilized. Purged water will be contained in 55-gallon drums for storage until the groundwater analysis results can be reviewed. The drums will be labelled with the applicable well number. If no contaminants are present, the water will be discharged on the ground. If contaminants are detected, the water will be stored on-site for later disposal at an appropriate facility. All details concerning well development, including the date, time, method and amount of water evacuated will be recorded by WWES personnel in a bound field logbook or on well data sheets.

2.3 SOIL SAMPLES

2.3.1 Soil Borings for Monitoring Well Installation

2.3.1.1 Sampling Location and Analysis

The scope of the subsurface soil sampling during monitoring well installation includes the collection of up to 30 investigative soil samples and 3 duplicates in the unsaturated zone for chemical analysis. Soil samples collected during the drilling of monitoring wells, GW26, GW27, GW28, GW29, GW35 and GW38, will be analyzed for the parameters summarized in Table 1 of the QAPP. In addition to the investigative samples, duplicate and blank samples will also be collected for quality assurance purposes. All soil cuttings will be containerized in 55-gallon drums for storage until the soil boring analysis results can be reviewed. The drums will be labelled according to which well the cuttings were collected and stored within a secured area until their ultimate fate can be determined.

All of the soil samples will be sent to laboratories involved with the for Routine Analytical Services (RAS) organic and RAS inorganic analyses. Additional samples will be sent to a CLP Laboratory under a SAS Request for analysis of additional pesticides and dioxin.

Additional soil samples will be collected during the drilling of GW24, GW30, and GW32, for lithologic description.

2.3.1.2 Sampling Equipment and Procedures

The borings will be installed using 4.25 inch I.D. HSA. Soil samples will be collected with a 2-3 inch split spoon sampler. Soil samples will be collected at depths of 2.5, 5, 7.5, and 10 feet, and at 5 foot intervals thereafter to the bottom of the borehole.

Unsaturated Zone Sampling

Each soil sample collected from wells GW26, GW27, GW28, GW29, GW35, and GW38, with the split spoon will be screened with an air monitoring device such as, an organic vapor analyzer (OVA), organic vapor meter (OVM), or a photoionization detector (HNU). If the screening registers two times above the ambient air, or if the soils are visibly stained or have an unusual odor, the sample will be retained for chemical analysis. The soil will be immediately transferred into the appropriate jars using a decontaminated stainless steel spatula. The samples will not be composited to reduce the loss of volatiles. One to five soil samples collected in the unsaturated zone will be selected for chemical analysis from each borehole. If no core sample fails the "meter, odor, vision" test, then the sample obtained directly at the water table will be selected for chemical analysis. Any remaining samples will be retained in clean jars for lithologic description.

Saturated Zone Sampling

Split spoon samples from wells GW24, GW30, and GW32, will be collected at five foot intervals, transferred into clean jars and retained for lithologic description. All sample collection procedural details will be documented in a bound field logbook or on data sheets at the time of collection. OVA, HNU and/or OVM measurements will also be recorded for each soil boring sample collected.

Soil boring samples will be collected using split spoons and stainless steel spatulas. All sampling equipment will be thoroughly washed in an alconox or tri-sodium phosphate (TSP) wash solution, tap water rinse and final rinse of distilled water. Split spoons used

to collect samples for chemical analyses will be decontaminated between each sample by washing or steam cleaning. Hexane will only be used if visible oil or dirt cannot be removed by conventional decontamination techniques. This will reduce the possibility of introducing volatile contaminants into the sample. The use of hexane will be documented in the field notes.

2.3.2 Additional Soil Borings

2.3.2.1 Sampling Locations and Analysis

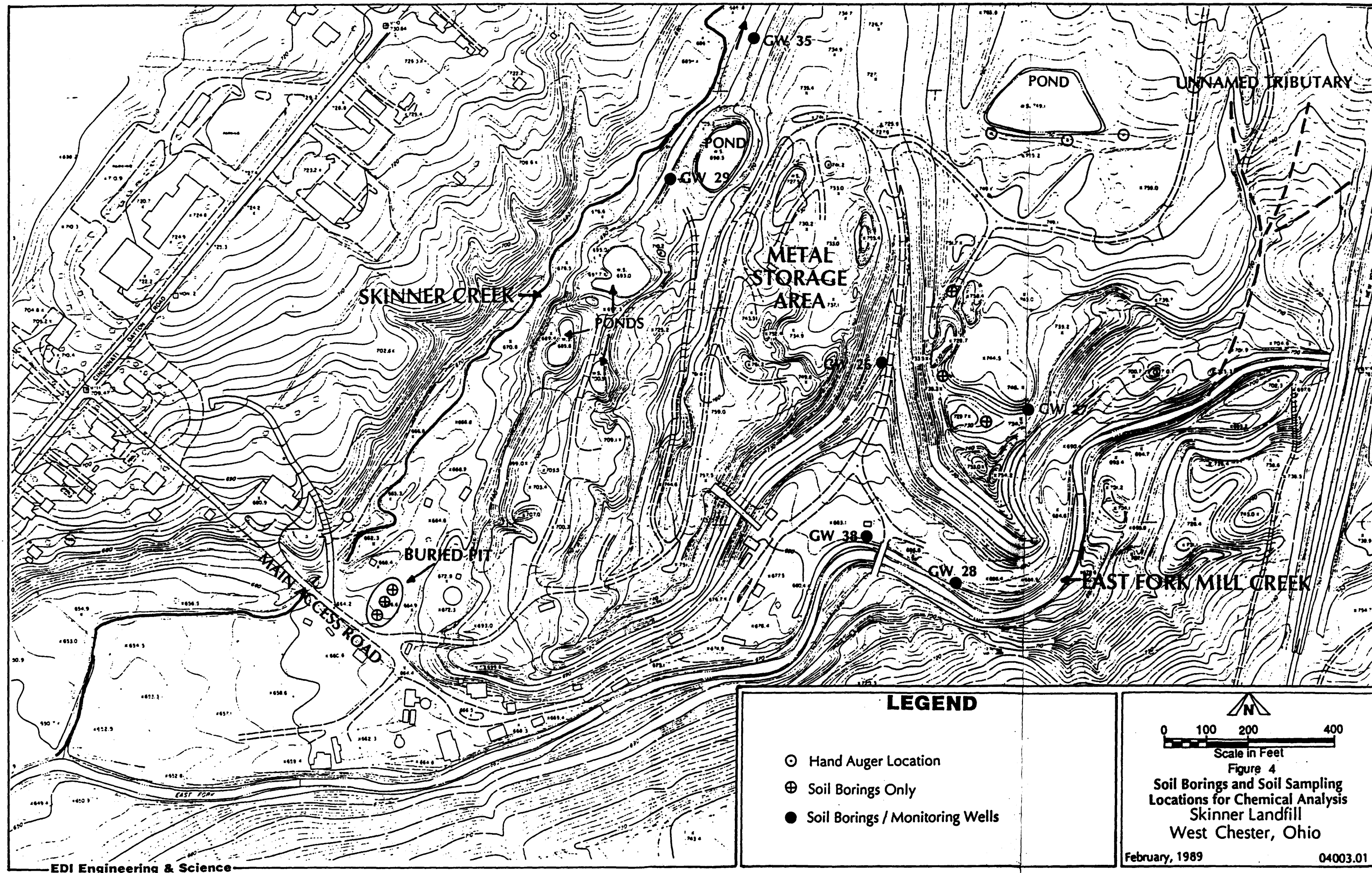
Additional soil borings will be performed at three locations adjacent to the buried lagoon and at three locations to locate a buried waste pond near Skinner Creek. The additional soil boring locations are shown on Figure 4.

Approximately thirty investigative samples will be collected. Duplicates and blank samples will also be collected for quality assurance purposes. The samples will be analyzed through the CLP for RAS organics and RAS inorganics. Additional SAS parameters include, dioxin for those borings installed near the buried lagoon and additional pesticides for all thirty samples.

2.3.2.2 Sampling Equipment and Procedures

The boring will be installed using 4.25 inch I.D. HSA. Soil samples will be collected with a 2-3 inch split spoon sampler. Soil samples will be collected at depths of 2.5, 5, 7.5, and 10 feet, and at 5 foot intervals thereafter to the water table.

Each soil sample collected with the split spoon will be screened with an HNu, OVA and/or OVM meter. If the screening registers two times above the ambient air, or if the soils are visibly stained or have an unusual odor, the sample will be retained for chemical analysis. The soil will be immediately transferred into the appropriate jars using a decontaminated stainless steel spatula. The samples will not be composited to reduce the loss of volatiles. One to five soil samples collected in the unsaturated zone will be selected for chemical analysis from each borehole. If no core sample fails the "meter, odor, vision" test, then the sample obtained directly above the water table will be selected for chemical analysis. Any remaining samples will be retained in clean jars for lithologic description.



LEGEND

- Hand Auger Location
- ⊕ Soil Borings Only
- Soil Borings / Monitoring Wells

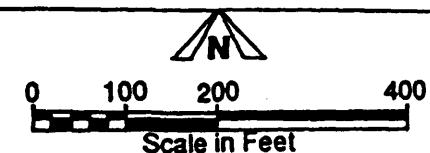


Figure 4
Soil Borings and Soil Sampling
Locations for Chemical Analysis
Skinner Landfill
West Chester, Ohio

2.3.3 Hand Auger Borings

2.3.3.1 Sampling Locations and Analysis

Soil samples will be collected at three locations north of the active landfill (see Figure 4) to assess the potential for contamination from runoff from the active landfill.

The soil boring samples will be sent to an approved CLP lab for RAS organics and RAS inorganics for metals and cyanide. SAS analyses will be performed for additional pesticides and TOC. Water blanks including field blanks and atmospheric blanks will also be prepared.

2.3.3.2 Sampling Equipment and Procedures

Two soil samples will be collected at each location. Samples will be collected at depths of 6 inches and 18 inches, using a hand auger.

Soil boring samples will be collected using split spoons and stainless steel spatulas. All sampling equipment will be thoroughly washed in an alconox or tri-sodium phosphate (TSP) wash solution, tap water rinse and final rinse of distilled water. Split spoons used to collect samples for chemical analyses will be decontaminated between each sample by washing or steam cleaning. Hexane will only be used if visible oil or dirt cannot be removed by conventional decontamination techniques. This will reduce the possibility of introducing volatile contaminants into the sample. The use of hexane will be documented in the field notes.

2.4 GROUND WATER SAMPLES

2.4.1 Sampling Locations and Analyses

Ground water samples will be collected from the 15 newly installed monitoring wells, including the replacement wells, and the 16 existing Skinner Landfill wells. Figure 3 shows the approximate locations of the monitoring wells to be sampled. Two sets of 2-well nests and two sets of 3-well nests will be installed during the Phase II to provide vertical gradient and contaminant stratification data at specific locations.

The ground water will be collected for the chemical analyses summarized in Table 1 of the QAPP. In addition to the 31 investigative samples, duplicate and field blank samples will also be collected. During ground water sampling, one atmospheric blank and one

field blank will be collected on a daily basis. One trip blank will be sent in each cooler containing volatile organics samples. The blank samples will be prepared as follows:

Atmospheric Blank Samples - atmospheric blank samples will be prepared at mid-day by pouring deionized water into the samples vials. The field blank samples will be analyzed for RAS Organics - volatile organics only. These blanks will help evaluate the possibility of airborne VOC cross-contamination.

Field Blank Samples - "bailer" or "pump" blank samples will be prepared to assess the adequacy of decontamination procedures. After the final distilled water rinse of the equipment, deionized will be poured into the bailer or pumped through the pump and then transferred into the appropriate sample containers. The decontamination blanks will be analyzed for RAS organics and RAS inorganics parameters and SAS parameters.

Trip Blank Samples - trip blank samples will be prepared upon receipt of the sample bottles. The trip blanks will be stored with and will accompany the bottles into the field and to the laboratory. The trip blanks will be analyzed for RAS organics - volatile organics only.

The duplicate and field blank samples will be filtered and preserved using the same procedures as the investigative samples.

The ground water samples will be sent to an approved CLP lab for RAS organics and RAS inorganics for metals and cyanide. In addition, the ground water samples will be analyzed by the CLP according to SAS requests for: chloride, sulfate, acidity, alkalinity, pH, TKN, total phosphorus, and nitrate/nitrite, additional pesticides, BOD, COD, ammonia, and total organic carbon.

2.4.2 Sampling Equipment and Procedures

The order of ground water sampling will proceed from monitoring wells believed to have the least amount of contamination to those that have the potential to be more contaminated (i.e. upgradient to downgradient). Sampling order will be finalized after the drilling has been completed and after consultation with the U.S. EPA Regional Project Manager (RPM). Prior to sampling, three to five times the water volume in the well will be evacuated until the pH and specific conductivity measurements stabilize. If the shallow wells dewater quickly, care will be taken to let the well recover completely before collecting the VOC samples. Purging will be completed with a Teflon bailer

and/or positive-displacement submersible pump. The purging procedure will be implemented as follows:

- The volume of water in the well will be calculated by measuring the depth to water, depth of well, and well diameter to obtain the variables for the equation:

$$V = Lr^2 (0.163)$$

Where:

V = Static Volume (gallons)

L = Length of water column in the well (feet)

r = Inside radius of the well (inches)

0.163 = pi times a factor to convert cubic inches to gallons

- Discharge water will be collected and measured to ensure that between three and five well volumes are removed prior to sample collection.
- If the well is completely dewatered during purging, purging will be reduced to two well volumes.
- The samples will be collected with a Teflon bailer having an open top and a Teflon check valve on the bottom. The ground water retrieved with the bailer will be immediately decanted into the appropriate sample bottles.

For wells sampled with the use of a pump, the procedure will be the same except that the sampling will be done at the pump discharge.

All ground water sampling equipment will be decontaminated using an alconox or TSP wash solution, a tap water rinse, and a distilled water final rinse. Hexane will only be used if visible oil and grease cannot be removed by conventional decontamination techniques. This will reduce the potential for introducing volatile contaminants into the sample. If hexane is used, it will be documented in the field notes. The pumps will be decontaminated by pumping the wash and rinse solutions through for a minimum of five minutes each. The equipment will be laid out on clean plastic to air dry before reuse.

Purge water will be captured and stored on-site in 55 gallon drums until the ground water analytical results can be reviewed. The drums will be labelled with the appropriate well number. If no contaminants are present, the water will be discharged on the ground. If contaminants are detected, alternate options for disposal will be selected.

All sampling details will be noted in a bound field logbook or on field data sheets. Field parameters such as pH, specific conductivity, temperature, color and noticeable odor will all be documented.

2.4.3 Ground Water Elevation Survey

Static water levels will be collected in all of the monitoring wells within a 12-hour period. These will be collected during a period of time when the wells have not been purged for at least one week. The ground water levels will be measured with a steel tape (or equivalent) to the top to the threads on the well casing. A more detailed documentation discussion is included in the QAPP.

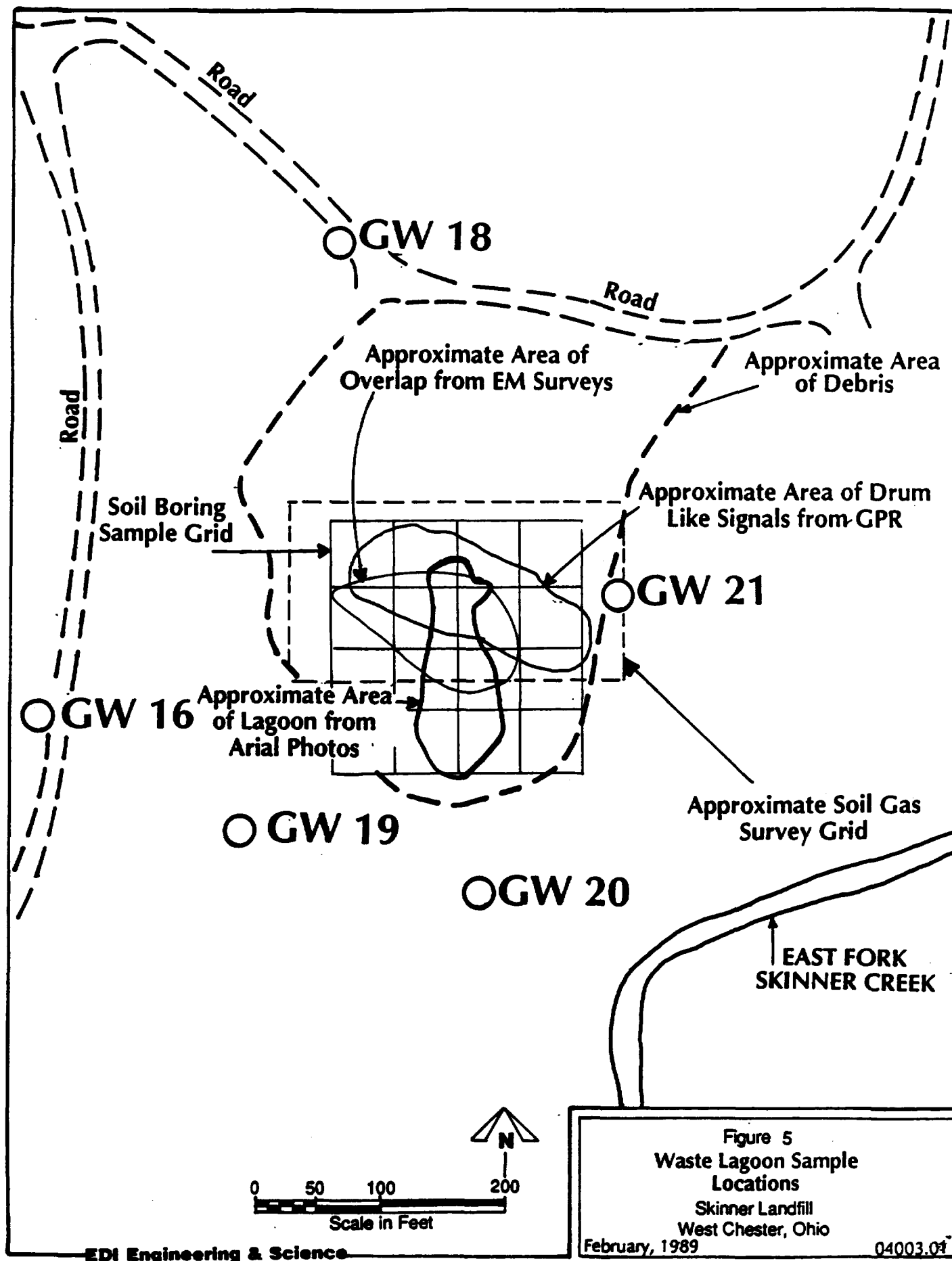
2.5 WASTE LAGOON SAMPLING

2.5.1 Sampling Locations and Analyses

Soil or waste samples will be collected from a maximum of 16 locations (see Figure 5) from the buried lagoon. A 200' x 200' grid will be established on top of the lagoon and separated into sixteen, 50' x 50' segments. One borehole will be drilled in each segment. The location of the grid will be based upon observations of aerial photos, geophysical surveys, and a soil gas survey.

Sampling will begin in the middle of the grid and proceed outward. Exact sample locations may be adjusted or deleted in the field if it becomes apparent the locations are beyond the lagoon boundary. Criteria for moving sampling locations will include the following: color/odor of waste, pH and specific conductance of any ground water, low readings from the organic vapor analyzer, and relative position to established locations. A maximum of three samples will be collected at each location for an approximate total of 48 samples.

A maximum of 48 investigative and 5 duplicate samples will be collected and sent to an approved CLP Lab for high RAS hazard organics and high hazard inorganics for metals and cyanide. Additional SAS analyses will be performed for dioxin, pesticides, and incinerator parameters. Field blanks will be collected to evaluate decontamination



procedures. Atmospheric blanks will be collected to evaluate the potential for cross-contamination from airborne sources.

2.5.2 Sampling Equipment and Procedures

Waste samples will be obtained by drilling through the construction debris with hollow stem augers (HSA), to a depth of approximately 30 feet or until the waste is encountered. Initial sampling will begin at the top of the waste lagoon and continue until the strata below the lagoon is reached. Waste/soil samples will be collected at approximately 5 foot depths for twenty feet once the lagoon is encountered. Due to the unknown contents of the lagoon, it may be necessary to collect more than three samples from one borehole. If distinct horizontal layers are encountered they will be sampled. All of the samples will be screened with an HNu or equivalent. The three samples registering the highest levels from the HNu will be sent for chemical analyses. Once the sampling is complete the hole will be back filled to the top of the waste with a combination of neat cement and bentonite.

The samples will be collected using a decontaminated split spoon sampler. The waste will be immediately transferred into the appropriate jars to reduce the loss of volatiles. The waste sampling equipment will be decontaminated with a steam cleaner between each sample. Hexane will only be used if visible oil or dirt cannot be removed by conventional decontamination techniques. This will reduce the possibility of introducing volatile contaminants into the sample. The appearance of all samples will be described and the samples will be scanned with an HNu, OVA, and/or OVM. All details concerning the waste samples will be documented in a bound field logbook or field data sheets. The sampling locations will be staked and properly labelled so that the locations can be surveyed in at a later date. Distance and direction to prominent features will be recorded in the event that the stake is destroyed.

In the event that refusal is consistently encountered during drilling with the hollow stem augers, waste sampling methods will be re-evaluated.

2.6 LEACHATE SAMPLING

2.6.1 Sampling Locations and Analysis

Leachate seeps have been observed in the past around the area of the buried lagoon. There is a permanent leachate seep along the bank of the East Fork of Mill Creek as

shown in Figure 6. This seep was sampled by WESTON in 1986 and was also evident during site visits in January 1989. This will be resampled in addition to other seeps occurring during the sampling event.

The leachate seeps will be collected for the analyses summarized in Table 1 of the QAPP. Trip blanks will accompany the cooler containing samples designated for volatile organic analysis. The leachate seep samples will be sent to an approved CLP Lab for RAS organics and RAS inorganics for metals and cyanide. In addition, the samples will be analyzed by the CLP according to SAS requests for; sulfate, chloride, nitrate-nitrite, alkalinity, pH, acidity, and total phosphorus, additional pesticides, BOD, COD, ammonia, TKN, and TOC.

2.6.2 Sampling Equipment and Procedures

Leachate seep samples will be collected by filling sample bottles directly from the seep. Care will be taken not to disturb any sediments. If necessary a collection trap will be established to aid in collecting samples.

All details concerning the leachate sampling will be recorded in a bound field log book or on field data sheets. Temperature, pH, and specific conductance will be recorded for each sample. Odor, discoloration, and any unusual features will also be recorded.

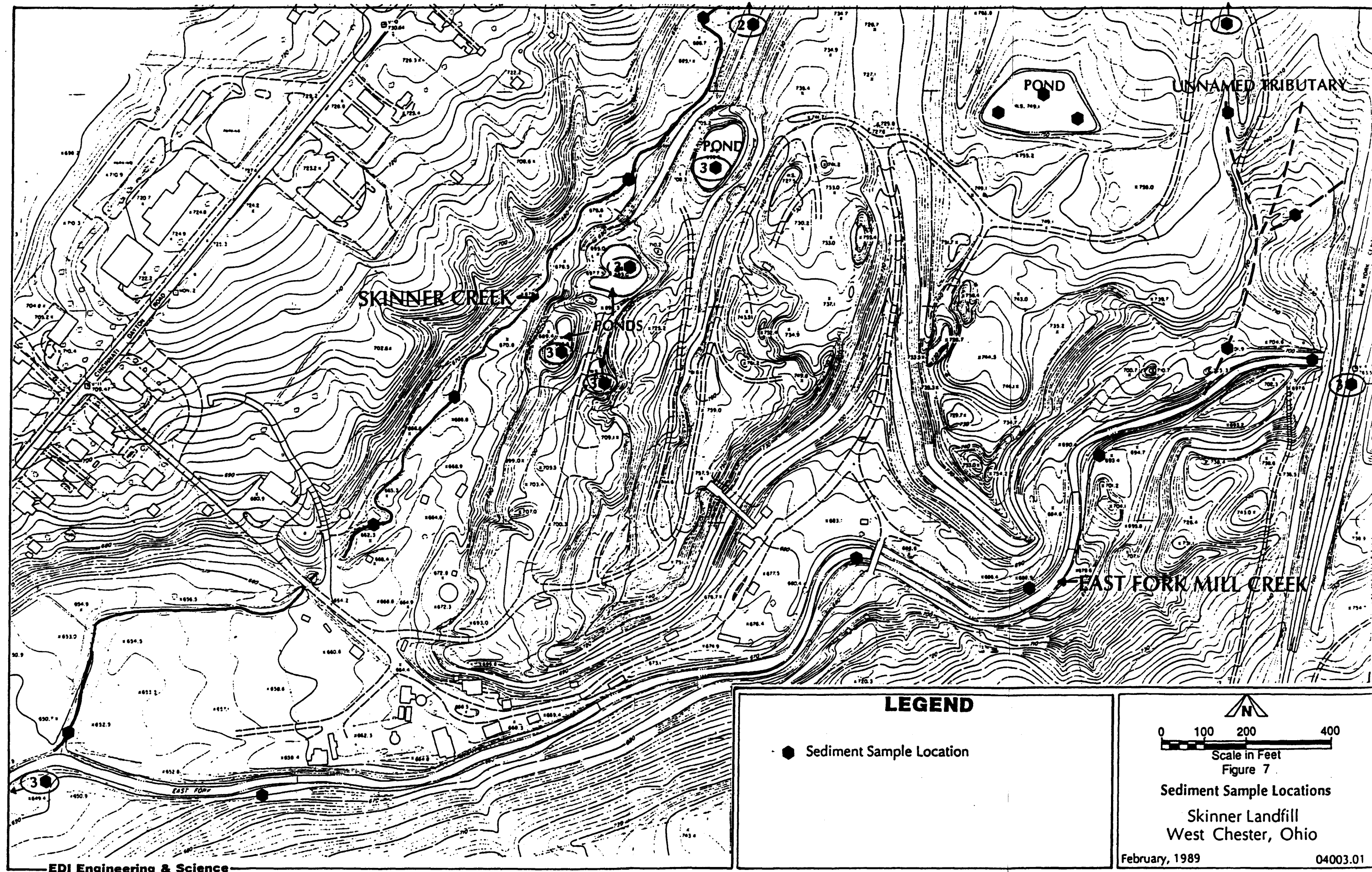
2.7 SURFACE WATER AND SEDIMENT SAMPLING

2.7.1 Ponds

2.7.1.1 Sampling Locations and Analyses

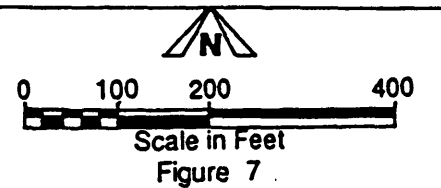
Surface water and sediment samples will be collected from five ponds located on or near the landfill to evaluate the nature of any potential contamination resulting from surface water runoff or contaminated ground water. Several ponds east of Skinner Creek were identified in Phase I of the RI as possible contamination sources. A more thorough investigation is needed to characterize the ponds.

A total of 15 surface water sediment sampling locations will be established as shown in Figures 6 and 7. The final locations will be selected in the field based upon existing field conditions. The tentative locations for both surface water and sediments include; 3 samples collected from each pond except for the next to northern most pond where 6

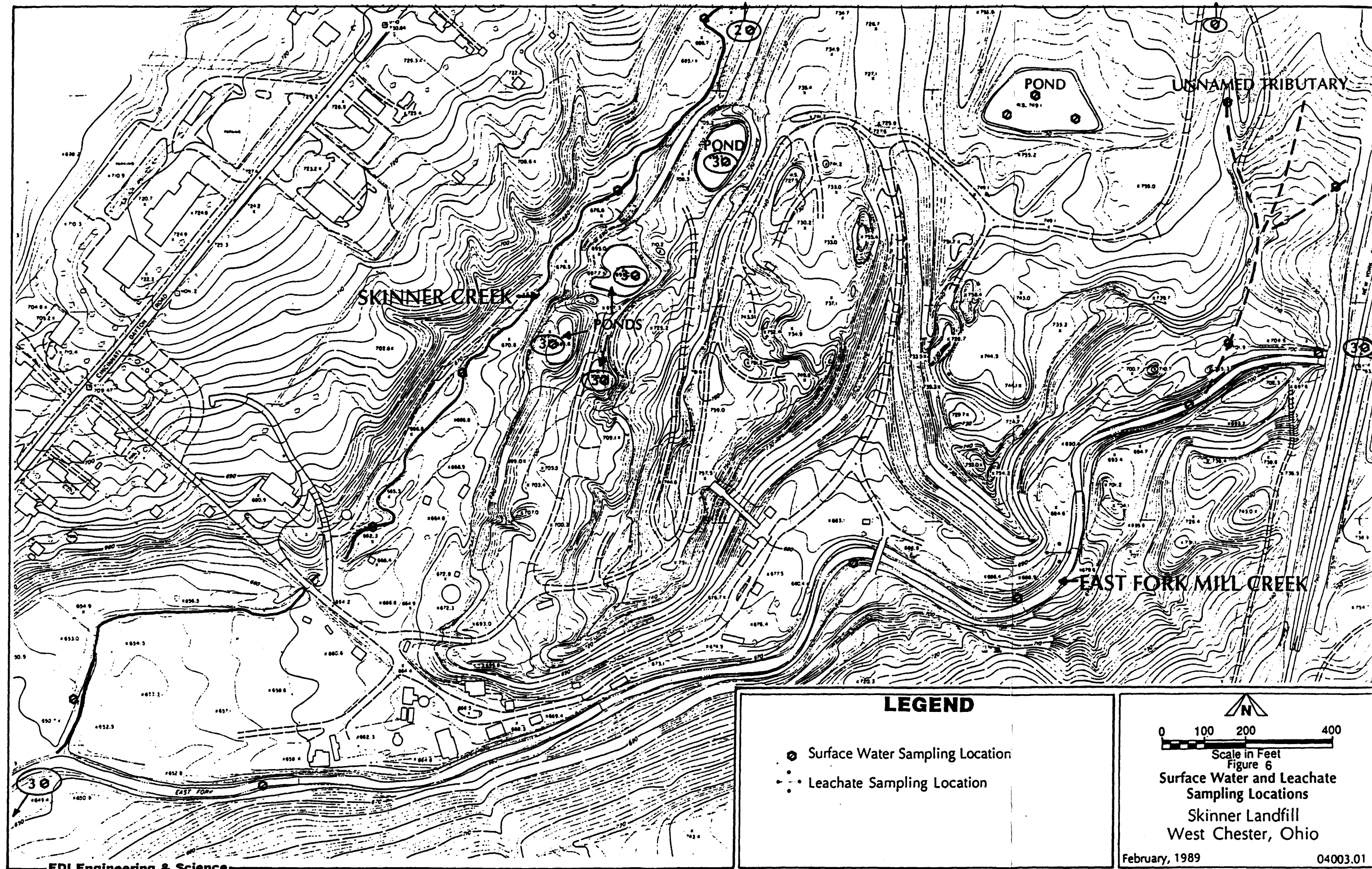


LEGEND

● Sediment Sample Location



Sediment Sample Locations
Skinner Landfill
West Chester, Ohio



samples will be collected. Because this pond is greater than 10 feet deep, 3 samples will be collected near the surface and 3 off the bottom for the next to the northern most pond

The surface water will be collected and analyzed for the parameters listed in Table 1 of the QAPP. In addition to the 15 investigative samples, duplicate, atmospheric blanks, and field blank samples will also be collected. The duplicate and field blank samples will be preserved using the same procedures as the investigative samples. Trip blanks will also accompany each cooler containing samples designated for volatile organic analyses. The surface water samples will be sent to an approved CLP Lab for RAS organics and RAS inorganics for metals and cyanide. In addition, the samples will be analyzed by the CLP according to SAS requests for; sulfate, chloride, nitrate-nitrite, alkalinity, acidity and ph, TDS, TSS, and (total) phosphorus.

Sediment will be collected and analyzed for the parameters listed in Table 1 of the QAPP. In addition to the 15 investigative samples, duplicates, atmospheric and field blank samples will also be collected. The sediment samples will be sent to an approved CLP Lab for RAS organics, RAS inorganics for metals and cyanide, and SAS for additional pesticides and Total Organic Carbon (TOC).

2.7.1.2 Sampling Equipment and Procedures

Surface water samples will be collected from 15 locations using a Van Dorn sampler (or equivalent) or sampling pump. In the next to northern most pond, three locations will be sampled at two separate depths due to possible stratification with depth. Three samples will be obtained 3 feet below the surface; and at the same sampling locations three samples will be obtained three feet above the bottom. In the remaining ponds, water samples will be collected approximately 1 foot off the bottom. A Van Dorn sampler (or equivalent) will be used which allows for varying sample depths.

After the water samples are obtained, sediment samples will be obtained using a ponar dredge or coring tube, whichever is more appropriate for the sediment type. Sediments will be immediately transferred into the appropriate sample containers to prevent loss of volatiles.

All pond surface water and sediment locations will be accessed by a small light weight boat to avoid disturbing sediments with the exception of the pond north of the landfill, which will be sampled using chest waders.

The sediment sampling equipment will be decontaminated with an alconox or TSP wash solution, a rinse of tap water, and a final rinse of distilled water prior to the collection of each sample. Hexane will only be used if visible oil or dirt cannot be removed by conventional decontamination techniques.

All details concerning surface water and sediments will be documented in a bound field logbook or on field data sheets. Temperature, pH, and specific conductance will be recorded for each surface water sample. OVA, OVM, or HNu measurements will be recorded for each sediment sample. Any unusual discolorations, odors, or textures will be noted in the field reports.

2.7.2 CREEKS

2.7.2.1 Sampling Locations and Analyses

Surface water and sediment samples will be collected from the East Fork of Mill Creek and Skinner Creek to evaluate the nature of any potential contamination resulting from surface water runoff or contaminated ground water.

A total of 25 surface water and 25 sediment sampling locations will be established as shown in Figures 6 and 7. The final locations will be selected in the field based upon existing field conditions. The tentative locations selected for both surface water and sediments include; 3 samples collected downstream from the junction of Skinner Creek and the East Fork of Mill Creek; 5 samples from the East Fork of Mill Creek on-site and 3 upstream off-site; 4 samples from Skinner Creek on site and 3 upstream off-site; and 4 samples from an unnamed tributary located adjacent to the eastern border of the landfill.

The surface water will be collected and analyzed for the parameters listed in Table 1 of the QAPP. In addition to the 25 investigative samples, duplicates, atmospheric blanks, and field blank samples will also be collected. The duplicate and field blank samples will be preserved using the same procedures as the investigative samples. Trip blanks will also accompany each cooler containing samples designated for volatile organic analyses. The surface water samples will be sent to an approved CLP Lab for RAS organics and RAS inorganics for metals and cyanide. In addition, the samples will be analyzed by the CLP according to SAS requests for: sulfate, chloride, nitrate-nitrite, alkalinity, acidity and pH, TDS, TSS, and phosphorus (total).

Sediment will be collected and analyzed for the parameters listed in Table 1 of the QAPP. In addition to the 25 investigative samples, duplicates, atmospheric and field blank samples will also be collected. The sediment samples will be sent to an approved CLP Lab for RAS organics, RAS inorganics for metals and cyanide, and SAS for additional pesticides and TOC.

Several locations on Skinner Creek and the East Fork of Mill Creek may be on private property. The assistance of the U.S. EPA will be sought in obtaining permission to collect samples at these locations.

2.7.2.2 Creek Sampling

Surface water samples will be collected from mid-stream locations in the creek. The surface water samples will be collected directly into the appropriate sample bottles by immersing a bottle in the creek until the bottle is full. Care will be taken to avoid disturbing the bottom sediments prior to collection. The samples will be collected from downstream to upstream to ensure that sediments disturbed by walking the stream will not be collected in the water samples. Samples will also be collected ahead of the sampler, by reaching forward, to avoid disturbing sediments. Sampling will be done, if at all possible, during periods of low flow. Sampling will be completed prior to any drilling work which may take place near the creeks.

The sediments will be collected concurrently with the surface water so as to duplicate the sampling location. Where possible, the samples will be collected in depositional environments. Samples will avoid gravels and attempt to obtain fine grained silts or clays. The upstream samples will serve as background samples. The sediment samples will be sampled with a ponar dredge or coring tube, whichever method is the most appropriate for the sediment type. A small shovel will be available, if necessary, for sampling. The sediment will be immediately transferred into the appropriate sample jars to reduce the loss of volatiles. The sediment sampling equipment will be decontaminated with an alconox or TSP wash solution, a rinse of tap water, and a final rinse in distilled water prior to the collection of each sample. Hexane will only be used if visible oil or dirt cannot be removed by conventional decontamination techniques. This will reduce the possibility of introducing volatile contaminants into the sample.

All details concerning the surface water and sediment sampling will be documented in a bound field logbook or on field data sheets. Additional parameters such as pH, specific conductivity and temperature will be recorded for each surface water sample. OVA,

HNu and/or OVM measurements will be recorded for each sediment sample. Visual observations such as color and lithologic description will also be noted.

The surface water and sediment sample locations will be staked on the adjacent shore and appropriately labelled for subsequent surveying. Distance and direction to prominent features will be recorded in the event that the stake is destroyed.

2.8 HYDRAULIC CONDUCTIVITY TESTING

Hydraulic conductivity (permeability) tests will be performed to determine the permeability of the aquifers and to calculate flow velocities. Refer to the QAPP Addendum for a more thorough discussion concerning testing techniques.

Hydraulic conductivity will be estimated from water level recovery data obtained from a "slug" test. Each well constructed for this study will be tested. Select wells from Phase I will be tested to compare permeability values to Phase II results. The recommended procedure will include the following steps:

- Measuring the static water level
- Displacing a volume of water in the well and allowing conditions outside the well to stabilize. A "falling head" test will be conducted by raising the water level with a small vacuum pump.
- Allowing water in well to recover to its pre-stress level.
- Recording the rate at which the water level recovers.

Normally, water level recovery is too rapid to measure manually. Hence, a pressure transducer and electronic recorder will be used for this purpose. This instrument will have the capability of measuring water levels and the time of measurement at a fraction of a second intervals.

The calculation of permeability will be made by one of several available equations that utilize well geometry and the position of the well screen within the aquifer boundaries as variables. Ten percent (or a minimum of one per day) of all in-site permeability measurements will be performed in duplicate to determine the precision of the technique. Field data will be transferred to a portable computer at the end of the day to aid in data interpretation and avoid confusion.

2.9 GEOPHYSICAL LOGGING

Several geophysical logging methods will be used to log the bedrock wells. The borehole logging investigation will allow lithologic correlations to be made between boreholes and will be used to determine whether fracturing or bedding plane orientation is controlling ground water flow in the bedrock.

Each borehole will be logged using the following methods; gamma, resistivity (both .25 and 2.5 normal), self-potential (SP), single point resistance, caliper, and temperature logging. The logging will be performed by an experienced WWES geophysicist and in accordance with standard operating procedures contained in Appendix E of the QAPP Addendum and the instrument operations manual.

Instrument sensitivity and meter scale settings will be recorded on each log so that data from the logs can be compared. All logs for this project will be run with the same recorder sensitivity settings if possible. A calibrated log is not necessary, since relative differences in gamma ray emissions and resistivity from formations is what is of interest. A Keck SR-3000 (or equivalent) Logger will be used for this work.

2.10 SAMPLE LOCATION SURVEYING

The tops of all monitor well casings will be surveyed for elevation to the nearest 0.01 of a foot. Ground surface and surface water elevations will also be surveyed. The wells will be horizontally located to an accuracy of five feet.

All other sampling locations including waste lagoon, soil, surface water, leachate and sediment will also be horizontally located to an accuracy of five feet and tied into the established monitoring well network. The sampling locations will be tied into prominent, permanent features and marked on the site map or topographic map.

The elevations and horizontal locations are determined with the use of a standard surveyor's level and stadia rod. A survey circuit is established beginning from a point of known elevation (such as a U.S.G.S. bench mark), proceeding to points of unknown elevation and returning to the point of beginning.

ATTACHMENT 1
PREVIOUS DATA

APPENDIX B

**CENTRAL REGIONAL LABORATORY
PARAMETERS FOR PUBLIC/PRIVATE WELLS**

APPENDIX B
CENTRAL REGION LABORATORY
PARAMETERS FOR PUBLIC/PRIVATE WELL SAMPLES
Volatile Organics

| <u>ANALYTE</u> | <u>CAS NO.</u> | <u>METHOD DETECTION LIMIT IN REAGENT WATER</u> |
|----------------------------|----------------|--|
| BENZENE | 71-43-2 | 1.5 |
| BROMODICHLOROMETHANE | 75-27-4 | 1.5 |
| BROMOFORM | 75-25-2 | 1.5 |
| BROMOMETHANE | 74-83-9 | 10 |
| CARBON TETRACHLORIDE | 56-23-5 | 1.5 |
| CHLOROBENZENE | 108-90-7 | 1.5 |
| CHLOROETHANE | 75-00-3 | 1.5 |
| 2-CHLOROETHYL VINYL ETHER | 110-75-8 | 1.5 |
| CHLOROFORM | 67-66-3 | 1.5 |
| CHLOROMETHANE | 74-87-3 | 10 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 1.5 |
| 1,1-DICHLOROETHANE | 75-34-3 | 1.5 |
| 1,2-DICHLOROETHANE | 107-06-2 | 1.5 |
| 1,1-DICHLOROETHENE | 75-35-4 | 1.5 |
| 1,2-DICHLOROETHENE (total) | 540-59-0 | 1.5 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 1.5 |
| cis-1,3-DICHLOROPROPENE | 10061-01-5 | 2 |
| trans-1,3-DICHLOROPROPENE | 10061-02-6 | 1 |
| ETHYL BENZENE | 100-41-4 | 1.5 |
| METHYLENE CHLORIDE (*) | 75-09-2 | 1 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 1.5 |
| TETRACHLOROETHENE | 127-18-4 | 1.5 |
| TOLUENE (*) | 108-88-3 | 1.5 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 1.5 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 1.5 |
| TRICHLOROETHENE | 79-01-6 | 1.5 |
| VINYL CHLORIDE | 75-01-4 | 1.5 |
| ACROLEIN | 107-02-8 | 100 |
| ACETONE (*) | 67-64-1 | 75 |
| ACRYLONITRILE | 107-13-1 | 50 |
| CARBON DISULFIDE | 75-15-0 | 3 |
| 2-BUTANONE | 78-93-3 | (50) |
| VINYL ACETATE | 108-05-4 | 15 |
| 4-METHYL-2-PENTANONE | 108-10-1 | (3) |
| 2-HEXANONE | 519-78-6 | (50) |
| STYRENE | 100-42-5 | 1 |
| m-XYLENE | 108-38-3 | 2 |
| o-XYLENE** | 95-47-6 | |
| p-XYLENE** | 106-42-3 | 2.5 |

* Common Laboratory Solvent-Blank Limit is 5X Method Detection Limit

** The o-Xylene and p-Xylene are Reported as a Total of the Two.

All units are micrograms/liter

APPENDIX B (cont)

Semi-Volatile Organics

| <u>ANALYTE</u> | <u>CAS No.</u> | METHOD DETECTION LIMIT IN REAGENT WATER | METHOD BLANK LIMIT IN REAGENT WATER |
|----------------------------------|----------------|--|--|
| BIS(2-CHLOROETHYL) ETHER | 111-44-4 | 1.5 | 3 |
| PHENOL | 108-95-2 | 2 | 4 |
| 2-CHOROPHENOL | 95-57-8 | 2 | 4 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 2 | 4 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 2 | 4 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 2.5 | 5 |
| BENZYL ALCOHOL | 100-51-6 | 2 | 4 |
| BIS(2-CHLOROISOPROPHYL) ETHER | 39638-32-9 | 2.5 | 5 |
| 2-METHYLPHENOL | 95-48-7 | 1 | 2 |
| HEXACHLOROETHANE | 67-72-1 | 2 | 4 |
| N-NITROSODIPROPYLAMINE | 621-64-7 | 1.5 | 3 |
| NITROBENZENE | 98-95-3 | 2.5 | 5 |
| 4-METHYLPHENOL | 106-44-5 | 1 | 2 |
| ISOPHORONE | 78-59-1 | 2.5 | 5 |
| 2-NITROPHENOL | 88-75-5 | 2 | 4 |
| 2,4-DIMETHYLPHENOL | 105-67-9 | 2 | 4 |
| BIS(2-CHLOROETHOXY) METHANE | 111-91-1 | 2.5 | 5 |
| 2,4-DICHLOROPHENOL | 120-83-2 | 2 | 4 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 2 | 4 |
| NAPHTHALENE | 91-20-3 | 2 | 4 |
| 4-CHLOROANILINE | 106-47-8 | 2 | 4 |
| HEXACHLOROBUTADIENE | 87-68-3 | 2.5 | 5 |
| BENZOIC ACID | 65-85-0 | (30) | (60) |
| 2-METHYLNAPHTHALENE | 91-57-6 | 2 | 4 |
| 4-CHLORO-3-METHYLPHENOL | 59-50-7 | 1.5 | 3 |
| HEXACHLOROCYCLO- PENTADIENE | 77-47-4 | 2 | 4 |
| 2,4,6-TRICHLOROPHENOL | 88-06-02 | 1.5 | 3 |
| 2,4,5-TRICHLOROPHENOL | 95-95-4 | 1.5 | 3 |
| 2-CHLORONAPHTHALENE | 91-58-7 | 1.5 | 3 |
| ACENAPHTHYLENE | 208-96-8 | 1.5 | 3 |
| DIMETHYL PHTHALATE | 131-11-3 | 1.5 | 3 |
| 2,6-DINITROTOLUENE | 606-20-2 | 1 | 2 |
| ACENAPHTHENE | 83-32-9 | 1.5 | 3 |
| 3-NITROANILINE | 99-09-2 | 2.5 | 5 |
| DIBENZOFURAN | 132-64-9 | 1 | 2 |
| 2,4-DINITROPHENOL | 51-28-5 | (15) | (30) |
| 2,4-DINITROTOLUENE | 121-14-2 | 1 | 2 |

All units are micrograms/liter

APPENDIX B (cont)

Semi-Volatile Organics

| <u>ANALYTE</u> | <u>CAS No.</u> | METHOD DETECTION LIMIT IN REAGENT WATER | METHOD BLANK LIMIT IN REAGENT WATER |
|-----------------------------|----------------|---|--|
| FLUORENE | 86-73-7 | 1 | 2 |
| 4-NITROPHENOL | 100-02-7 | 1.5 | 3 |
| 4-CHLOROPHENYL PHENYL ETHER | 7005-72-3 | 1 | 2 |
| DIETHYL PHTHALATE | 84-66-2 | 1 | 2 |
| 4,6-DINITRO-2-METHYLPHENOL | 534-52-1 | (15) | (30) |
| 1,2-DIPHENYLHYDRAZINE | 122-66-7 | 1 | 2 |
| N-NITROSODIPHENYLAMINE* | 86-30-6 | | |
| DIPHENYLAMINE* | 122-39-4 | 1.5 | 3 |
| 4-NITROANILINE | 100-01-6 | 3 | 6 |
| 4-BROMOPHENYL PHENYL ETHER | 101-55-3 | 1.5 | 3 |
| HEXACHLOROBENZENE | 118-74-1 | 1.5 | 3 |
| PENTACHLOROPHENOL | 87-86-5 | 2 | 4 |
| PHENANTHRENE | 85-01-8 | 1 | 2 |
| ANTHRACENE | 120-12-7 | 2.5 | 5 |
| DI-n-BUTYL PHTHALATE | 84-74-2 | 2 | 4 |
| FLUORANTHENE | 206-44-0 | 1.5 | 3 |
| PYRENE | 129-00-0 | 1.5 | 3 |
| BUTYL BENZYL PHTHALATE | 85-68-7 | 3.5 | 7 |
| CHRYSENE** | 218-01-9 | | |
| BENZO(a)ANTHRACENE** | 56-55-3 | 1.5 | 3 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 117-81-7 | 1 | 2 |
| DI-n-OCTYL PHTHALATE | 117-84-0 | 1.5 | 3 |
| BENZO(b)FLUORANTHENE*** | 205-99-2 | | |
| BENZO(k)FLUORANTHENE*** | 207-08-9 | 1.5 | 3 |
| BENZO(a)PYRENE | 50-32-8 | 2 | 4 |
| INDENO(1,2,3-cd)PYRENE | 193-39-5 | 3.5 | 7 |
| DIBENZO(a,h)ANTHRACENE | 53-70-3 | 2.5 | 5 |
| BENZO(g,h,i)PERYLENE | 191-24-2 | 4 | 8 |
| 1-NITROANILINE | 88-74-4 | 1 | 2 |

* THESE TWO PARAMETERS ARE REPORTED AS A TOTAL

** THESE TWO PARAMETERS ARE REPORTED AS A TOTAL

*** THESE TWO PARAMETERS ARE REPORTED AS A TOTAL

Values in parantheses are estimates. Actual values are being determined at this time.

All units are micrograms/liter.

APPENDIX B (cont)

Pesticides/PCB's

| <u>ANALYTE</u> | <u>CAS No.</u> | <u>METHOD DET. LIMIT IN REAGENT WATER</u> | <u>SPIKE LEVEL</u> | <u>CONTROL LIMITS IN REAGENT WATER</u> |
|--------------------|----------------|---|------------------------|--|
| ALDRIN | 309-00-2 | 0.005 | 5 | 3-6 |
| alpha BHC | 319-84-6 | (0.010) | | |
| beta BHC | 319-85-7 | (0.005) | | |
| delta BHC | 319-86-8 | (0.005) | | |
| gamma BHC(LINDANE) | 58-89-9 | 0.005 | 2 | 1-4 |
| CHLORDANE | 57-74-9 | (0.020) | | |
| 4,4'-DDD | 72-54-8 | (0.020) | | |
| 4,4'-DDE | 72-55-9 | (0.005) | | |
| 4,4'-DDT | 50-29-3 | 0.020 | 15 | 10-18 |
| DIELDRIN | 60-57-1 | 0.010 | 5 | 3-6 |
| ENDOSULFAN I | 959-98-8 | 0.010 | 6 | 4-7 |
| ENDOSULFAN II | 33213-65-9 | 0.010 | | |
| ENDOSULFAN SULFATE | 1031-07-8 | (0.10) | | |
| ENDRIN | 72-20-8 | 0.010 | 10 | 6-12 |
| ENDRIN ALDEHYDE | 7421-93-4 | (0.030) | | |
| ENDRIN KETONE | 53494-70-5 | (0.030) | | |
| HEPTACHLOR | 76-44-8 | 0.030 | 2 | 1-4 |
| HEPTACHLOR EPOXIDE | 1024-57-3 | 0.005 | | |
| 4,4'-METHOXYCHLOR | 72-43-5 | 0.020 | 20 | 15-28 |
| TOXAPHENE | 8001-35-2 | (0.25) | | |
| PCB-1242 | 53469-21-9 | (0.10) | 3 | 2-6 |
| PCB-1248 | 12672-29-6 | (0.10) | | |
| PCB-1254 | 11097-69-1 | (0.10) | | |
| PCB-1260 | 11096-82-5 | (0.10) | | |

Values in parentheses are estimates. Actual values are currently being determined.

All units are micrograms/liter.

APPENDIX B (cont)

Inorganics

| <u>ANALYTE</u> | <u>Required Detection Limits (ug/l)</u> | <u>Method</u> |
|----------------|---|---------------|
| 1. Aluminum | 100 | ICP |
| 2. Antimony | 2 | GFAA |
| 3. Arsenic | 2 | GFAA |
| 4. Barium | 50 | ICP |
| 5. Beryllium | 5 | ICP |
| 6. Cadmium | 10 | ICP |
| 7. Calcium | 1000 | ICP |
| 8. Chromium | 10 | ICP |
| 9. Cobalt | 10 | ICP |
| 10. Copper | 10 | ICP |
| 11. Iron | 100 | ICP |
| 12. Lead | 2 | GFAA |
| 13. Magnesium | 1000 | ICP |
| 14. Manganese | 10 | ICP |
| 15. Mercury | 0.2 | Cold Vapor |
| 16. Nickel | 20 | ICP |
| 17. Potassium | 2000 | ICP |
| 18. Selenium | 2 | GFAA |
| 19. Silver | 5 | ICP |
| 20. Sodium | 1000 | ICP |
| 21. Thallium | 2 | GFAA |
| 22. Vanadium | 10 | ICP |
| 23. Zinc | 20 | ICP |
| 24. Cadmium | 0.2 | GFAA |
| 25. Cyanide | 5.0 | Colorimetric |

These metals will be reported for Superfund site residential well samples analyzed at the CRL. Other additional metals may be reported for informational purposes only (i.e., boron, lithium, molybdenum, strontium, titanium, and yttrium). The following metals will be analyzed by GFAA: cadmium, antimony, arsenic, lead, selenium, and thallium. Mercury is analyzed by Cold Vapor Atomic Absorption and the cyanide analysis is a colorimetric method. All of the other metals are analyzed by ICP. When requesting metals analysis at the CRL, each of the GFAA metals noted above and mercury and cyanide must be requested separately from the ICP metals.

STANDARD OPERATING PROCEDURE FOR VOLATILE ORGANIC ANALYSIS
IN WATER AND SEDIMENTS
BY PURGE AND TRAP GC/MS
624 NS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES

TEAM LEADER _____

SECTION CHIEF _____

QUALITY CONTROL COORDINATOR _____

LABORATORY DIRECTOR _____

STANDARD OPERATING PROCEDURE FOR VOLATILE
ORGANIC ANALYSIS BY PURGE AND TRAP GC/MS
METHOD 624 NS

1. SCOPE AND APPLICATION

1.1

- 1.1.1 The method covers the determination of a number of purgeable organics by purge and trap/gas chromatography/mass spectrometry in drinking water and waste water. The following parameters will be determined by this method:

| | |
|----------------------------------|-----------------------|
| Acetone | Tetrachloroethylene |
| Benzene | Toluene |
| Bromodichloromethane | 1,1,1-trichloroethane |
| Bromoform | 1,1,2-trichloroethane |
| Bromoethane | Trichloroethylene |
| 2-Butanone (methyl ethyl ketone) | Styrene |
| Carbon Disulfide | Vinyl Acetate |
| Carbon Tetrachloride | Vinyl Chloride |
| Chlorobenzene | m-xylene |
| 2-Chloroethyl vinyl ether | o-xylene * |
| Chloroform | p-xylene * |
| Chloromethane | |
| Dibromochloromethane | |
| 1,1-Dichloroethane | |
| Trans-1,2 Dichloroethane | |
| 1,2-Dichloropropane | |
| Cis-1,3-Dichloropropane | |
| Trans-1,3-Dichloropropane | |
| Ethylbenzene | |
| 2-Hexanone | |
| Methylene chloride | |
| 4-methyl-2-pentanone | |
| 1,1,2,2-Tetrachloroethane | |

* Do not resolve.
Reported as total.

- 1.1.2 The method may be extended to run sediment/soil samples using a modification of the purge and trap equipment. As explained in section 3.3.

- 1.1.3 The method may be extended to analyze samples for 1,3-dichlorobenzene, total 1,2/1,4-dichlorobenzene, acrolein and acrylonitrile.

- 1.1.4 Xylenes are reported as m-xylene and total o/p-xylene.

1.2 NPDES Method

1.2.1 The following parameters will be determined by this method:

| Parameter | CAS No. | Parameter | CAS No. |
|--------------------------|----------|---------------------------|------------|
| Benzene | 71-43-2 | 1,1-Dichloroethylene | 75-35-4 |
| Bromodichloromethane | 75-27-4 | Trans-1,2-Dichloroethane | 156-60-5 |
| Bromoform | 75-25-2 | 1,2-Dichloropropane | 78-87-5 |
| Bromomethane | 74-83-9 | cis-1,3-Dichloropropane | 10061-01-5 |
| Carbon tetrachloride | 65-23-5 | Trans-1,3-Dichloropropane | 10061-02-6 |
| Chlorobenzene | 108-90-7 | Ethyl benzene | 100-41-4 |
| Chloroethane | 75-00-3 | Methylene chloride | 75-09-2 |
| 2-Chloroethylvinyl ether | 110-75-8 | 1,1,2,2-Tetrachloroethane | 79-34-5 |
| Chloroform | 67-66-3 | Tetrachloroethene | 127-18-4 |
| Chloromethane | 74-87-3 | Toluene | 108-88-3 |
| Dibromochloromethane | 124-48-1 | 1,1,1-Trichloroethane | 71-55-6 |
| 1,2-Dichlorobenzene | 95-50-1 | 1,1,2-Trichloroethane | 79-00-5 |
| 1,3-Dichlorobenzene | 541-73-1 | Trichloroethylene | 79-01-6 |
| 1,4-Dichlorobenzene | 106-46-7 | Vinyl chloride | 75-01-4 |
| 1,1-Dichloroethane | 75-34-3 | | |
| 1,2-Dichloroethane | 107-06-2 | | |

1.2.2 The method may be extended to analyze for acetone, acrolein, acrylonitrile, carbon disulfide, 2-butanone (methyl ethyl ketone), 4-methyl-2-pentanone, 2-hexanone, styrene, and o, m, p-xylene.

1.2.3 Analysis of the compounds listed in section 1.2.2 beyond acrolein and acrylonitrile must be specifically requested since they are run in support of other regulatory programs.

1.2.4 1,2/1,3/1,4-dichlorobenzene will be run by this method when no corresponding samples are submitted for ABN (acid/base-neutral) GC/MS analysis. The results will be reported as 1,3-dichlorobenzene and total 1,2/1,4-dichlorobenzene. Similarly, m-xylene and total o/p-xylene will be reported on request.

1.3 The method detection limit (MDL, defined in section 8.5) for each parameter is listed in Appendix 1. The MDL for a parameter may differ from those listed, depending upon the nature of interferences in the sample matrix.

1.3.1 Detection limits reported by CRL are dependent upon the sensitivity of a particular instrument. The report MDLs are typical of the systems in use. CRL detection limits are updated annually for each systems in use; the current update is found in Appendix 1.

1.3.2 CRL detection limits will be adjusted accordingly if samples are diluted. For example, if a sample is diluted 3:1 and the previous CRL detection limit for a parameter was 1.0 ppb, the adjusted detection limit reported will be 3.0 ppb.

1.4 This method is restricted to use by or under the supervision of analysts experienced in the operation of a purge and trap system and a gas chromatograph/mass spectrometer and mass spectral interpretation. Each analyst must have demonstrated the ability to generate acceptable results with this method using the procedure described in section 11.1.

1.4.1 All samples are logged into VOA injection log books and each sample is assigned a file ref. number (FRN) to collect mass spectral data on a disc. Once the data set is completed, the disc is copied onto nine-track magnetic tape and stored. All tapes are cataloged and the disc is erased for reuse.

A log book is maintained for standards used in VOA analysis. Whenever a standard is prepared, a log book entry is made which will show the date, the source and conc. of standard, how it is made and the chemist who prepares it.

2. SAFETY

2.1 The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. Material safety data for all chemicals used in VOA analysis is kept in room no. 1019.

2.2 The following parameters covered by this method have been tentatively classified as known or suspected, human or mammalian carcinogens: benzene, carbon tetrachloride, chloroform and vinyl chloride. Primary standards of these toxic compounds should be prepared in a hood. A NIOSH/MESA approved toxic gas respirator should be worn where the analyst handles high concentrations of these toxic compounds. Due caution for all standards used in this method should be a high priority.

2.3 Waste Disposal

Most of the water samples are used up in VOA analysis. The remaining sample is discharged in the sink and containers are disposed in the garbage. Unused sediment samples are returned to custodian for safe keeping. Unused standards are collected in the toxic waste can and stored for safe disposal.

APPENDIX 5

Current CRL VOA Instrumentation

Purge and Trap: Tekmar Liquid Sample Concentration LSC-2
Tekmar ALS Auto Laboratory Sampler (10 unit)

The above apparatus in unison with Hewlett Packard SIDS software has the ability to run 10 samples in BATCH format. 25mL needle sparge samplers replace the frit spargers on the Tekmar ALS-10.

GC/MS: Hewlett Packard 5840A Gas Chromatograph, 5985A Mass Spectrometer with 21MX E series computer/7920 disc drive using SIDS software

Data reduction is usually performed with the above computer system but may be done with the stand above Finnegan Super Incos System computer.

Presently, data to be reduced using the Finnegan system must be transferred to tape using the Hewlett Packard 7960B Digital Tape Drive. The tape is transferred to Finnegan top loading cartridge using a Finnegan (Perkin Elmer) tape drive.

SUPPLEMENTARY DOCUMENT #3

Deviations from Superfund (CLP) VOA Protocol (1/85 Revision)

- 1) Three internal standards (bromochloromethane, 1-chloro-2-bromopropane, 1,4-dichlorobutane) and four surrogates (D_4 -1,2-dichloroethane, D_6 -Benzene, D_8 -toluene, bromofluorobenzene) are used.
- 2) Water samples are 15mL not 5mL in volume.
- 3) Mass range used is 42-250amu not 35-260amu.
- 4) The method may be extended for analysis of 1,2-1,3-, and 1,4-dichlorobenzene not mentioned in the Superfund (CLP) protocol.
- 5) Soil/sediment sample quantitation is not based upon a dry weight basis.
- 6) Additional duplicate spike data is taken.

- 1) The three primary internal standards (bromochloromethane, 1-chloro-2-bromopropane, 1,4-dichlorobutane) are used in place of the 3 standards used in the original CLP procedure. The original standards do not present any advantage over the proposed standards. The proposed compounds are presently being used in the NPDES SOP and have several years recovery data.

Surrogate standards are the same as NPDES SOP surrogates except that BFB is added for a total of 4. In this way, all the surrogates in the CLP method (original) will be common to the new protocol.

- 2) Larger sample sizes have been shown to have equivalent or better response/sensitivity as 5mL samples. The purging devices with spurge needle are easier to maintain and use for sediment/soil samples.
- 3) A narrower mass range is employed owing to the fact that the ions from 35-41 and 251-260 are unnecessary for the final analysis except possibly for rare unknown compound quantitative analysis.
- 4) A longer run time can yield analysis of dichlorobenzenes if so desired.
- 5) Samples for sediment/soil analysis are run "as is" without allowance for dry weight.
- 6) Duplicate spike analysis is done over the entire set of HSL parameters. Purgeable AB compounds are always checked for duplicate spikes; other compounds are rotated for additional spiking.

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
BASE/NEUTRALS AND ACIDS
IN WATER

METHOD 625 NS
(GS/MS)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

Date

CONCURRENCES

TEAM LEADER _____

SECTION CHIEF Francis Thomas 9/10/87

QUALITY COORDINATOR [Signature] 9/10/87

LABORATORY DIRECTOR [Signature] 9/10/87

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
BASE/NEUTRALS AND ACIDS IN WATER

METHOD 625 NS (GS/MS)

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| 3. SUMMARY OF METHOD | 1 | 0 | AUGUST 87 | 2 |
| 4. SAMPLE COLLECTION, PRESERVATION, AND HANDLING | 1 | 0 | AUGUST 87 | 2 |
| 5. INTERFERENCES | 2 | 0 | AUGUST 87 | 2 |
| 6. APPARATUS AND MATERIALS | 2 | 0 | AUGUST 87 | 3 |
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STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
BASE/NEUTRALS AND ACIDS IN WATER

METHOD 625 NS

(GS/MS)

1. Scope and Application

- 1.1 This procedure applies to solvent extracts of water prepared by the Region 5 Central Regional Laboratory (CRL). This procedure is also applicable to the determination of base/neutral and/or acid extractable organic compounds in municipal and industrial discharges. The parameters listed in Table 1 are qualitatively and quantitatively determined by this method. N-nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine.
- 1.2 This is the CRL implementation of method 625-Base/Neutrals and Acids, and complies with 40 CFR 136.1
- 1.3 The method detection limit for each parameter is listed in Table 1. The MDL for a specific wastewater may differ from those listed, depending on the nature of interferences in the sample matrix.

2. Safety and Waste Handling

- 2.1 The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound is treated as potential health hazard. From this viewpoint, exposure to these chemicals is reduced to lowest possible level. The laboratory maintains a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method.
- 2.2 The following parameters covered by this method have been tentatively classified as known or suspected, human or mammalian carcinogens: benzo(a)anthracene, benzo(a)pyrene, and dibenzo(a,h)anthracene. Primary standards of these toxic compounds are prepared in a hood.

3. Summary of Method

- 3.1 A measured volume of sample, approximately 1 liter, is serially extracted with methylene chloride at a pH greater than 11 and again at a pH less than 2 using a separately funnel or a continuous extractor. The methylene chloride extract is dried, concentrated to a volume of 1 ml, and analyzed by GC/MS. Based on extract knowledge of the sample, some extracts are screened on Gas Chromatograph/Flame Ionization Detector (GC/FID) before injection onto the Gas Chromatograph/Mass Spectrometer (GC/MS). Qualitative identification of the parameters in the extract is performed using the retention time and relative abundance of three characteristic masses (m/z). Quantitative analysis is performed using internal standard techniques with a single characteristic m/z . The final reports issued for each sample list hazardous substances and tentatively identified compounds.

4. Sample Collection, Preservation, and Handling

- 4.1 Grab samples are collected in glass containers. Conventional sampling practices are followed, and composite samples are collected in refrigerated glass containers in accordance with the requirements of the program. Automatic sampling equipment is as free as possible of Tygon tubing and other potential sources of contamination.
- 4.2 All samples are iced or refrigerated at 4° C from the time of collection until extraction.
- 4.3 At the laboratory, sample extracts are stored in a refrigerator until requested for analysis by a GC/MS operator. After injection on the GC/MS, the vial septa are replaced and the vials are again stored under refrigeration. All samples are extracted within 7 days of collection and completely analyzed within 21 days of collection.

5. Interferences

- 5.1 Method interferences may be caused by contaminants in solvents, reagents, glassware and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the total ion current profiles. All of these materials are routinely demonstrated to be free from interferences under the conditions of the analysis by running laboratory reagent blanks as described in Section 11.3.

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
ORGANOCHLORINE PESTICIDES AND PCB's

IN WATER

METHOD 608 DNS
(GC/EC, SEPARATORY FUNNEL EXTRACTION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5 SCRL)
CHICAGO, ILLINOIS 60605

DATE 9/87

CONCURRENCES

TEAM LEADER _____

SECTION CHIEF _____

QUALITY COORDINATOR _____

LABORATORY DIRECTOR _____

ORGANOCHLORINE PESTICIDES AND PCB's
IN WATER
METHOD 608 DNS
(GC/EC. SEPARATORY FUNNEL EXTRACTION)

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| 3. SUMMARY OF METHOD | 1 | 0 | 9-87 | 2 |
| 4. SAMPLE HANDLING AND PRESERVATION | 2 | 0 | 9-87 | 2 |
| 5. INTERFERENCES | 2 | 0 | 9-87 | 3 |
| 6. APPARATUS | 2 | 0 | 9-87 | 4 |
| 7. REAGENTS | 4 | 0 | 9-87 | 5 |
| 8. PROCEDURE | 1 | 0 | 9-87 | 2 |
| 9. CALCULATIONS | 1 | 0 | 9-87 | 3 |
| 10. QUALITY CONTROL | 1 | 0 | 9-87 | 3 |
| 11. PREVENTATIVE MAINTENANCE | 1 | 0 | 9-87 | 3 |
| 12. TROUBLE SHOOTING/CORRECTIVE ACTION | 1 | 0 | 9-87 | 3 |
| REFERENCES | 1 | 0 | 9-87 | 3 |
| ATTACHMENTS | 0 | 0 | 9-87 | N/A |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF ORGANOCHLORINE PESTICIDES
AND PCBs IN WATER METHOD 608 DNS (GC/EC)

1. SCOPE AND APPLICATION

- 1.1 This is a Gas Chromatographic (GC) method applicable to the determination of compounds listed below in municipal and industrial discharges under 40 CFR 136, Superfund protocol and 40 CFR 141.243 (Safe Drinking Water Act). The programs that cover this method are NPDES.
- 1.2 This method covers the determination of certain organochlorine pesticides and PCB's. See Table I for list of Parameters that can be determined by this method.
- 1.3 **Detection Limit**
The Method Detection Limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The MDL concentrations listed in Table I were obtained by the procedure outlined in 40 CFR part 136, pages 198 - 199 using reagent water. The MDL achieved in a given analysis will vary depending on instrument sensitivity and matrix effects.
- 1.4 This method is restricted to use by or under the supervision of analysts experienced in the use of GC and in the interpretation of Gas Chromatograms.

2. SAFETY AND WASTE HANDLING

- 2.1 The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound is

TABLE I

APPROXIMATE
RETENTION TIMES (Mins)

| | Mixed Phase - Column | Single Phase Column |
|--------------------|-------------------------|------------------------|
| Aldrin | 5.39 | 4.83 |
| ALPHA - BHC | 2.83 | 2.10 |
| BETA - BHC | 4.10 | 2.14 |
| DELTA - BHC | 4.80 | 2.52 |
| GAMMA - BHC | 3.59 | 2.45 |
| Chlordane (Total) | Multiple Peaks | |
| 4,4'- DDD | 18.17 | 10.57 |
| 4,4'- DDE | 11.87 | 8.39 |
| 4,4'- DDT | 21.98 | 13.74 |
| Dieldrin | 12.45 | 8.46 |
| Endosulfan I | 10.16 | 7.27 |
| Endosulfan II | 18.35 | 9.56 |
| Endosulfan Sulfate | 28.65 | 12.37 |
| Endrin | 15.16 | 9.56 |
| Endrin Aldehyde | 23.79 | 10.57 |
| Endrin Ketone | 39.39 | 15.78 |
| Heptachlor | 4.44 | 3.91 |
| Heptachlor Epoxide | 8.07 | 5.86 |
| Methoxychlor | 42.67 | 20.25 |
| Toxaphene | Multiple peaks | |
| PCB - 1221 | Multiple peaks | |
| PCB - 1232 | Multiple peaks | |
| PCB - 1242/1016 | Multiple peaks | |
| PCB - 1248 | Multiple peaks | |
| PCB - 1254 | Multiple peaks | |
| PCB - 1260 | Multiple peaks | |

TABLE I (Continued)

PESTICIDES AND PCB METHOD DETECTION LIMITS AND CHROMATOGRAPHIC CONDITIONS

| PARAMETERS | METHOD DETECTION LIMIT ug/LITER |
|-------------------------|---------------------------------------|
| gamma BHC Lindane | 0.002 |
| Heptachlor | 0.030 |
| Aldrin | 0.02 |
| Heptachlor epoxide | 0.01 |
| Endosulfan I | 0.01 |
| Dieldrin | 0.01 |
| Endrin | 0.01 |
| Endosulfan II | 0.01 |
| pp-DDE | 0.02 |
| beta-BHC | 0.02 |
| delta-BHC | 0.02 |
| alpha-BHC | 0.02 |
| pp-DDD | 0.04 |
| pp-DDT | 0.02 |
| Methoxy Chlor | 0.02 |
| Endosulfan sulfate | 0.13 |
| Endrin aldehyde | 0.05 |
| Endrin Ketone | 0.03 |
| Dibutyl Chlorendate* | 0.03 |
| Chlordane | 0.2 |
| Toxaphene | 1 |

| PARAMETERS | METHOD DETECTION LIMIT ug/LITER |
|------------|---------------------------------------|
| PCB - 1221 | 0.2 |
| PCB - 1232 | 0.2 |
| PCB - 1242 | 0.2 |
| PCB - 1016 | 0.2 |
| PCB - 1248 | 0.2 |
| PCB - 1254 | 0.2 |
| PCB - 1260 | 0.2 |

COLUMN ONE: 1.5% SP-2250/1.95%
SP-2401 on 100-200 Mesh Supelcoport
packed in 8 Ft. x 1/4 inch O.D. x 2mm
I.D. glass column.

COLUMN TWO: 3% SP-2100 on 100-200
Mesh Supelcoport packed in 8 Ft. x 1/
inch O.D x 2mm I.D. glass column

CHROMATOGRAPHIC CONDITIONS

Column Temperature: 200°C

Detector Temperature: 325°C

Injection Temperature: 250°C

Injection Volume: 5uL

Carrier Gas: 5% Methane in Argon

FLOW RATE

COLUMN ONE: 30 cc/min

COLUMN TWO: 30 cc/min

*SURROGATE

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
METALS BY ICP

METHOD 200.7 NS (ICP)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5 SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER _____

SECTION CHIEF _____

QUALITY CONTROL COORDINATOR _____

LABORATORY DIRECTOR _____

John V. Malone 19 Oct 87

[Signature] 10-17-87

[Signature] 10/20/87

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF METALS BY ICP

METHOD 200.7 NS (ICP)

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| 3. SUMMARY OF METHOD | 1 | 0 | SEPT 87 | 2 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | SEPT 87 | 2 |
| 5. INTERFERENCES | 4 | 0 | SEPT 87 | 2 |
| 6. APPARATUS | 2 | 0 | SEPT 87 | 5 |
| 7. REAGENTS | 2 | 0 | SEPT 87 | 6 |
| 8. PROCEDURE | 1 | 0 | SEPT 87 | 9 |
| 9. CALCULATIONS | 1 | 0 | SEPT 87 | 13 |
| 10. QUALITY CONTROL | 5 | 0 | SEPT 87 | 13 |
| 11. PREVENTATIVE MAINTENANCE | 1 | 0 | SEPT 87 | 17 |
| 12. TROUBLESHOOTING/CORRECTIVE ACTION | 1 | 0 | SEPT 87 | 17 |
| REFERENCES | 1 | 0 | SEPT 87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF METALS BY ICP
METHOD 200.7 NS (ICP)

1. SCOPE AND APPLICATION

1.1 The method can be used to determine twenty-five elements. The method is approved for NPDES samples for twenty of these metals (Federal Register, Vol 49, No. 209, Fri. Oct. 26, 1984). The other five are auxiliary and are reported for the information of the requesting agency.

1.2 The detection limits and concentration ranges are listed below:

| <u>Element</u> | <u>Detection Limit</u> <u>ug/L</u> | <u>Concentration</u> <u>Range ug/L</u> |
|---------------------------|---------------------------------------|---|
| Ag | 6 | 3 - 10,000 |
| Al (low) | 80 | 80 - 20,000 |
| Ba | 6 | 5 - 20,000 |
| Be | 1 | 1 - 20,000 |
| B | 80 | 80 - 20,000 |
| Cd | 10 | 10 - 20,000 |
| Co | 6 | 6 - 20,000 |
| Cr | 8 | 8 - 20,000 |
| Cu | 6 | 6 - 20,000 |
| Fe (low) | 80 | 80 - 20,000 |
| Mn | 5 | 5 - 20,000 |
| Mo | 15 | 10 - 20,000 |
| Ni | 15 | 15 - 20,000 |
| Pb | 70 | 70 - 20,000 |
| V | 5 | 5 - 20,000 |
| Zn | 40 | 40 - 20,000 |
| | <u>mg/L</u> | <u>mg/L</u> |
| Al (high) | 20 | 20 - 1,000 |
| Ca (low) | 0.5 | 0.5 - 25 |
| Ca (high) | 25 | 25 - 1,000 |
| Fe (high) | 20 | 20 - 1,000 |
| K | 2 | 1 - 1,000 |
| Mg | 0.1 | 0.1 - 1,000 |
| Na | 1 | 1 - 1,000 |
| Zn (high) | 20 | 20 - 1,000 |
| <u>Auxiliary Elements</u> | <u>ug/L</u> | <u>ug/L</u> |
| Li | 10 | 10 - 20,000 |
| Sn | 40 | 40 - 20,000 |
| Sr | 10 | 10 - 20,000 |
| Ti | 25 | 25 - 20,000 |
| Y | 5 | 5 - 20,000 |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
ANTIMONY IN WATER
METHOD 204.2 NS (AA, FURNACE, STANDARD ADDITION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER _____

SECTION CHIEF _____

QUALITY CONTROL COORDINATOR _____

LABORATORY DIRECTOR _____

John W. Plon 296yd
CS Plon 10-6-87
CS Plon 10/2/87 7

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
ANTIMONY IN WATER
METHOD 204.2 NS (AA, FURNACE, STANDARD ADDITION)

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| 3. SUMMARY OF METHOD | 1 | 0 | 9/87 | 1 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | 9/87 | 2 |
| 5. INTERFERENCES | 3 | 0 | 9/87 | 2 |
| 6. APPARATUS | 2 | 0 | 9/87 | 4 |
| 7. REAGENTS | 1 | 0 | 9/87 | 6 |
| 8. INSTRUMENT CALIBRATION | 4 | 0 | 9/87 | 6 |
| 9. CALCULATIONS AND DATA REDUCTION | 1 | 0 | 9/87 | 10 |
| 10. QUALITY CONTROL | 2 | 0 | 9/87 | 11 |
| 11. MAINTENANCE | 1 | 0 | 9/87 | 13 |
| 12. TROUBLE SHOOTING/CORRECTIVE ACTION | 1 | 0 | 9/87 | 13 |
| REFERENCES | | 0 | 9/87 | |
| ATTACHMENTS | | 0 | 9/87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
ARSENIC IN WATER
METHOD 206.2 DNS (AA, FURNACE, STANDARD ADDITION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER _____
SECTION CHIEF John M. 29 Sept 87
QUALITY CONTROL COORDINATOR St. John 10-6-87
LABORATORY DIRECTOR _____

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
ARSENIC IN WATER
METHOD 206.2 DNS (AA, FURNACE, STANDARD ADDITION)

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| 3. SUMMARY OF METHOD | 1 | 0 | 9/87 | 1 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | 9/87 | 2 |
| 5. INTERFERENCES | 3 | 0 | 9/87 | 2 |
| 6. APPARATUS | 2 | 0 | 9/87 | 4 |
| 7. REAGENTS | 1 | 0 | 9/87 | 6 |
| 8. INSTRUMENT CALIBRATION | 4 | 0 | 9/87 | 6 |
| 9. CALCULATIONS AND DATA REDUCTION | 1 | 0 | 9/87 | 10 |
| 10. QUALITY CONTROL | 2 | 0 | 9/87 | 11 |
| 11. MAINTENANCE | 1 | 0 | 9/87 | 13 |
| 12. TROUBLE SHOOTING/CORRECTIVE ACTION | 1 | 0 | 9/87 | 13 |
| REFERENCES | | 0 | 9/87 | |
| ATTACHMENTS | | 0 | 9/87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
CADMIUM IN WATER
METHOD 213.2 DNS (AA, FURNACE, STANDARD ADDITION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER _____
SECTION CHIEF John V. Mann 29 Sept 87
QUALITY CONTROL COORDINATOR SE Khan 10-6-87
LABORATORY DIRECTOR _____

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
CADMIUM IN WATER
METHOD 213.2 DNS (AA, FURNACE, STANDARD ADDITION)

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| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | 9/87 | 2 |
| 5. INTERFERENCES | 3 | 0 | 9/87 | 2 |
| 6. APPARATUS | 2 | 0 | 9/87 | 4 |
| 7. REAGENTS | 1 | 0 | 9/87 | 6 |
| 8. INSTRUMENT CALIBRATION | 4 | 0 | 9/87 | 6 |
| 9. CALCULATIONS AND DATA REDUCTION | 1 | 0 | 9/87 | 10 |
| 10. QUALITY CONTROL | 2 | 0 | 9/87 | 11 |
| 11. MAINTENANCE | 1 | 0 | 9/87 | 13 |
| 12. TROUBLE SHOOTING/CORRECTIVE ACTION | 1 | 0 | 9/87 | 13 |
| REFERENCES | | 0 | 9/87 | |
| ATTACHMENTS | | 0 | 9/87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
CHROMIUM IN WATER
METHOD 218.2 DNS (AA, FURNACE, STANDARD ADDITION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER _____
SECTION CHIEF John V. Mason 29 Sept 82
QUALITY CONTROL COORDINATOR John V. Mason 10-6-87
LABORATORY DIRECTOR _____

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
CHROMIUM IN WATER
METHOD 218.2 DNS (AA, FURNACE, STANDARD ADDITION)

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| 3. SUMMARY OF METHOD | 1 | 0 | 9/87 | 1 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | 9/87 | 2 |
| 5. INTERFERENCES | 3 | 0 | 9/87 | 2 |
| 6. APPARATUS | 2 | 0 | 9/87 | 4 |
| 7. REAGENTS | 1 | 0 | 9/87 | 6 |
| 8. INSTRUMENT CALIBRATION | 4 | 0 | 9/87 | 6 |
| 9. CALCULATIONS AND DATA REDUCTION | 1 | 0 | 9/87 | 10 |
| 10. QUALITY CONTROL | 2 | 0 | 9/87 | 11 |
| 11. MAINTENANCE | 1 | 0 | 9/87 | 13 |
| 12. TROUBLE SHOOTING/CORRECTIVE ACTION | 1 | 0 | 9/87 | 13 |
| REFERENCES | | 0 | 9/87 | |
| ATTACHMENTS | | 0 | 9/87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
LEAD IN WATER
METHOD 239.2 DNS (AA, FURNACE, STANDARD ADDITION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER _____

SECTION CHIEF J. L. Brown 29 Sept 87

QUALITY CONTROL COORDINATOR [Signature] 10-6-87

LABORATORY DIRECTOR _____

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
LEAD IN WATER
METHOD 239.2 DNS (AA, FURNACE, STANDARD ADDITION)

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| 3. SUMMARY OF METHOD | 1 | 0 | 9/87 | 1 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | 9/87 | 2 |
| 5. INTERFERENCES | 3 | 0 | 9/87 | 2 |
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| 7. REAGENTS | 1 | 0 | 9/87 | 6 |
| 8. INSTRUMENT CALIBRATION | 4 | 0 | 9/87 | 6 |
| 9. CALCULATIONS AND DATA REDUCTION | 1 | 0 | 9/87 | 10 |
| 10. QUALITY CONTROL | 2 | 0 | 9/87 | 11 |
| 11. MAINTENANCE | 1 | 0 | 9/87 | 13 |
| 12. TROUBLE SHOOTING/CORRECTIVE ACTION | 1 | 0 | 9/87 | 13 |
| REFERENCES | | 0 | 9/87 | |
| ATTACHMENTS | | 0 | 9/87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
SELENIUM IN WATER
METHOD 270.2 DNS (AA, FURNACE, STANDARD ADDITION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER

SECTION CHIEF

QUALITY CONTROL COORDINATOR

LABORATORY DIRECTOR

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
SELENIUM IN WATER
METHOD 270.2 DNS (AA, FURNACE, STANDARD ADDITION)

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| 3. SUMMARY OF METHOD | 1 | 0 | 9/87 | 1 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | 9/87 | 2 |
| 5. INTERFERENCES | 3 | 0 | 9/87 | 2 |
| 6. APPARATUS | 2 | 0 | 9/87 | 4 |
| 7. REAGENTS | 1 | 0 | 9/87 | 6 |
| 8. INSTRUMENT CALIBRATION | 4 | 0 | 9/87 | 6 |
| 9. CALCULATIONS AND DATA REDUCTION | 1 | 0 | 9/87 | 10 |
| 10. QUALITY CONTROL | 2 | 0 | 9/87 | 11 |
| 11. MAINTENANCE | 1 | 0 | 9/87 | 13 |
| 12. TROUBLE SHOOTING/CORRECTIVE ACTION | 1 | 0 | 9/87 | 13 |
| REFERENCES | | 0 | 9/87 | |
| ATTACHMENTS | | 0 | 9/87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
SILVER IN WATER
METHOD 272.2 DNS (AA, FURNACE, STANDARD ADDITION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER _____

SECTION CHIEF _____

QUALITY CONTROL COORDINATOR _____

LABORATORY DIRECTOR _____

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
SILVER IN WATER
METHOD 272.2 DNS (AA, FURNACE, STANDARD ADDITION)

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| 3. SUMMARY OF METHOD | 1 | 0 | 9/87 | 1 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | 9/87 | 2 |
| 5. INTERFERENCES | 3 | 0 | 9/87 | 2 |
| 6. APPARATUS | 2 | 0 | 9/87 | 4 |
| 7. REAGENTS | 1 | 0 | 9/87 | 6 |
| 8. INSTRUMENT CALIBRATION | 4 | 0 | 9/87 | 6 |
| 9. CALCULATIONS AND DATA REDUCTION | 1 | 0 | 9/87 | 10 |
| 10. QUALITY CONTROL | 2 | 0 | 9/87 | 11 |
| 11. MAINTENANCE | 1 | 0 | 9/87 | 13 |
| 12. TROUBLE SHOOTING/CORRECTIVE ACTION | 1 | 0 | 9/87 | 13 |
| REFERENCES | | 0 | 9/87 | |
| ATTACHMENTS | | 0 | 9/87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
THALLIUM IN WATER
METHOD 279.2 NS (AA, FURNACE, STANDARD ADDITION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE:

CONCURRENCES:

TEAM LEADER _____

SECTION CHIEF J. R. M. 2914512

QUALITY CONTROL COORDINATOR D. J. 10-6-87

LABORATORY DIRECTOR _____

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
THALLIUM IN WATER
METHOD 279.2 NS (AA, FURNACE, STANDARD ADDITION)

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STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
IN WATER
METHOD (AA, FURNACE, STANDARD ADDITION)

1. SCOPE AND APPLICATION

- 1.1 This procedure is applicable to the determination of arsenic, antimony, cadmium, chromium, silver, thallium, lead, and selenium in water. This method meets the requirements of SDWA, NPDES and Superfund.

2. SAFETY AND WASTE HANDLING

- 2.1 Most of the elements analyzed are very toxic. Handle the standard solutions with care. Follow the rules detailed in the CRL Health and Safety Manual and the toxic substance safety plans.
- 2.2 Disposal of Standard solutions:
- 2.2.1 Any concentrated stock (1000 ug/L) should be poured into a red labelled (acidic metals) waste container.
- 2.2.2 Selenium and Arsenic standards that contain high nickel matrix modifier should be disposed of in the red labelled waste containers.
- 2.2.3 All standards containing low levels of any element should be disposed of in the red labelled waste containers.

3. SUMMARY OF METHOD

The concentration of a metal in a sample can be determined by measuring the absorption of the radiation in the atomic vapors produced from the sample at a wavelength that is characteristic of the element of concern.

The atomic vapors are produced by the use of an electrothermal source (furnace). The radiation being absorbed at a specific wavelength is controlled by the energy source Hollow Cathode Lamp (HCL) or Electrodeless Discharge Lamp (EDL) and the monochromator. The measuring is done by the detector and read-out systems. Depending on sample sources, interferences encountered, and nature of the matrix, testing is done by the method of standard additions.

TABLE 4

| Element | Detection Limit# ug/L | Lab Control** Standard ug/L | (Source) | Current AQC Limits** | Current Duplicate Limit. * |
|---------|-----------------------------|-----------------------------------|---|----------------------------|----------------------------------|
| Sb | 2 | 20.3 | (WP1183) Trace Metals II conc. #2, 2 ml/1 L | 18.3-22.3 | 2 |
| As | 2 | 23.5 | (WP284 TMI) conc. #2 diluted 1 ml/1 L | 21.2-25.8 | 4 |
| Cd | 0.2 | 0.78 | (WP284) conc. #2 | 0.86-0.70 | 0.2 |
| Cr | 0.5 | 9.3 | (NBS SRM 16436 2Xd11) | 8.4-10.2 | 1.5 |
| Pb | 2 | 22.4 | (WP284) conc. #2 2.5 ml/1 L | 20.2-24.6 | 4 |
| Se | 2 | 9.8 | (WP284 2 ml/1 L) conc. #2, ICV-2(1186) 5 ml/1 L | 8.8-10.8 | 2 |
| Ag | 0.1 | 2.8 | (NBS SRM 16436) | 2.5-3.1 | 0.5 |
| Tl | 2 | 25.0 | (WP1183) Trace Metals II conc. #1, 10 ml/1 L | 22.5-27.5 | 2 |

* Absolute Difference (ug/L)

** Current Lab Control Standard

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V CENTRAL REGIONAL LABORATORY
CHICAGO , ILLINOIS

DATE:

SUBJECT: Cadmium and Lead by AA, Graphite Platform

FROM: John Morris

TO: CURTIS ROSS
DIRECTOR, CRL

This memo is to document a change to or deviation from a CRL procedure or policy.

PROCEDURE/POLICY: Analysis of Cadmium and Lead

EFFECTIVE DATE: June 20, 1988

☒ This is a change to a standard operating policy/procedure.

☐ This is a temporary deviation :

1. The deviation will be for the following data sets:

OR

2.

*This acceptable SIP pending reservations
to use of Ependorf pipette for prep of
standards.*

TEAM LEADER John V. Morris
SECTION CHIEF _____
QUALITY COORDINATOR _____
DIRECTOR _____

STANDARD OPERATING PROCEDURE FOR THE DETERMINATION OF
CADMIUM AND LEAD
BY FLAMELESS PLATFORM ATOMIC ABSORPTION

AA, FURNACE, PLATFORM, STANDARD CURVE

1. Scope and application

1.1 This method is applicable to the determination of lead and cadmium in drinking water, ground water, well water and digested samples. Any samples with visible particles should be digested.

2. Safety and Waste Handling

2.1 The elements are very toxic. Handle the standard solutions with care. Wear gloves and follow the rules detailed in the CRL Health and Safety Manual and Toxic Substance Safety Plans.

2.2 Disposal of calibration solutions

2.2.1 Unused portions of concentrated stock (1000 ug/L) solutions must be poured into a red labeled (acidic metals) waste container.

2.2.2 Intermediate solutions must be poured into the red labeled waste containers.

2.2.3 Working standards may be disposed of in the sink after appropriate neutralization as they are below the drinking water limits.

3. Summary of Method

Samples are analyzed for lead and cadmium using a platform graphite furnace on a Zeeman background corrected atomic absorption spectrometer. The absorbencies are converted to concentrations using a standard curve. Two aliquots of the sample are analyzed. One of the aliquots is mixed with an equal volume of a blank solution; the other is mixed with an equal volume of a working standard. For lead the standard is 20 ug/L and for cadmium the standard is 1 ug/L. If the recovery of the aliquot with the standard is unacceptable, the sample is rerun using standard additions technique. The detection limit for cadmium is 0.2 ug/L and for lead is 1 ug/L. Results are reported to Water Supply Branch in mg/L and all other programs in ug/L.

4. Sample Handling and Preservation

4.1 Samples should be collected in one liter high density polyethylene bottles with polypropylene caps. These bottles must be soaked for twenty four hours with dilute nitric acid before use. The bottles have been found to be contaminated with lead.

4.2 The samples should be preserved in the field to a pH of <2. Usually, 5 mL of 8N HNO₃ per liter of sample is adequate.

Brief Outline of Method for the Experienced Analyst

I. Wash all pipette tips, solo cups, sample cups and sample bottles in distilled water or dilute nitric acid before use. See method.

II. Samples and Standards

- A. Digest any samples with particles by appendix method
- B. Matrix modifier is 1 mL nitric, 2g Ammonium dihydrogen phosphate and .017 g of Magnesium nitrate hexahydrate in 100 mL.
- C. Prepare the working standards fresh daily in five 100 mL volumetric flasks with 0.5 mL nitric acid and 'super Q' water.
 - 1. For cadmium use 0, 0.5, 1.0, 1.5 and 2.0 mL of the 100 ug/L standard. (7.6)
 - 2. For lead use 0, 1.0, 2.0, 3.0 and 4.0 mL of the intermediate, 1000 ug/L, standard (7.5)
- D. Do blank and AQC before starting and after every ten samples.
- E. Sample run twice, once with zero standard and once with middle standard, 20 Pb or 1 Cd

III. Spectrometer Turn on cooling water, Argon and instrument

- A. Light lamp
- B. 0.7 SLIT LOW, PEAK AREA, REC ABS, t=5, ZAA and Accessory ON
- C. PRINT, if desired.
- D. ABS or CONC with EXP if desired
- E. Align lamp
- F. Cd 228.8 Pb 283.3 PEAK

IV. Furnace settings RCL and CHK or enter settings below

| CD | STEP 1 | STEP 2 | STEP 3 | STEP 4 | STEP 5 |
|----------|--------|--------|--------|--------|--------|
| TEMP | 150 | 700 | 1600 | 2600 | 20 |
| RAMP | 1 | 1 | 0 | 1 | 1 |
| HOLD | 60 | 45 | 5 | 6 | 20 |
| BASELINE | | | -6 | | |
| REC | | | -8 | 0 | |
| READ | | | -1 | | |
| INT FLOW | | | 0 | | |

| PB | STEP 1 | STEP 2 | STEP 3 | STEP 4 | STEP 5 |
|----------|--------|--------|--------|--------|--------|
| TEMP | 150 | 900 | 1800 | 2600 | 20 |
| RAMP | 1 | 5 | 0 | 1 | 1 |
| HOLD | 60 | 45 | 5 | 6 | 20 |
| BASELINE | | | -6 | | |
| REC | | | -8 | 0 | |
| READ | | | -1 | | |
| INT FLOW | | | 0 | | |

V. Autosampler

- A. Put in new tube and check alignment and delivery
- B. Calibrate Optical Sensor Cd 1600 Pb 1800
- C. SAMPLE VOLUME 10
- D. ALT VOLUME 5
- E. INST PROG and HGA PROG on same and correct numbers

VI. Computer and printer on

- A. Put disks in drives and give date and time
- B. DATA
- C. May give title and user if desired
- D. Name data file
- E. L for printer code
- F. COLLECT DATA after sampling has started
- G. TO DISK to store file
- H. SYSTEM to exit

VII. Calculate spike recovery

- A. 90% - 110% report
- B. Over 110%
 - 1. Below detection limit - report
 - 2. Above detection limit - MSA
- C. Under 90% MSA, unless Drinking Water and less than detection limit, 60% - 90%, double detection limit

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF

CYANIDE IN WATER

METHOD 335.2 NS
(COLORIMETRIC, AUTOMATED, MANUAL DISTILLATION)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

DATE

CONCURRENCES

TEAM LEADER *Pamela Danice* 9/14/87

SECTION CHIEF *John N. Moore* 14 Sept 87

QUALITY CONTROL COORDINATOR *St. Paul* 9/14/87

LABORATORY DIRECTOR *[Signature]* 9/14/87

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
CYANIDE IN WATER
METHOD 335.2 NS (COLORIMETRIC, AUTOMATED, MANUAL DISTILLATION)

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| 3. SUMMARY OF METHOD | 1 | 0 | 9/87 | 1 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | 9/87 | 2 |
| 5. INTERFERENCES | 1 | 0 | 9/87 | 2 |
| 6. APPARATUS | 2 | 0 | 9/87 | 2 |
| 7. REAGENTS | 2 | 0 | 9/87 | 3 |
| 8. PROCEDURE | 5 | 0 | 9/87 | 4 |
| 9. CALCULATIONS | 1 | 0 | 9/87 | 8 |
| 10. QUALITY CONTROL | 3 | 0 | 9/87 | 8 |
| 11. PREVENTATIVE MAINTENANCE | 1 | 0 | 9/87 | 10 |
| 12. TROUBLESHOOTING/CORRECTIVE ACTION | 1 | 0 | 9/87 | 10 |
| REFERENCES | 1 | 0 | 9/87 | 11 |
| ATTACHMENTS | 1 | 0 | 9/87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
CYANIDE IN WATER
METHOD 335.2 NS (COLORIMETRIC, AUTOMATED, MANUAL DISTILLATION)

1. SCOPE AND APPLICATION

- 1.1 This method is applicable to drinking, surface, and saline waters; domestic and industrial wastes. It is approved for NPDES samples.
- 1.2 The approximate working range of the distillation is 5 ug CN/L and above. The approximate working range of the spectrophotometric determination is 5 - 200 ug CN/L.
- 1.3 Cyanide is not a primary or secondary drinking water parameter. The maximum contaminant level is established by permit and is site specific.

2. SAFETY AND WASTE HANDLING

- 2.1 All solutions must be kept basic to prevent the release of hydrogen cyanide.
- 2.2 The pyridine color reagent is very toxic and odorous. The colorimeter outlet should be kept acidic to remove the pyridine.
- 2.3 Failure of the vacuum system will cause the acidic, possibly cyanide filled, solution to come out of the distilling flask. The vacuum system must be consistent and reliable.
- 2.4 The effluent from the colorimetric and distillation head is collected and discarded in the blue-labeled (basic) waste container
- 2.5 All of the unused standards, AQC's will be discarded in the blue-labeled (basic) waste container.
- 2.6 Unused reagents will be discarded by pouring into regular laboratory drain.

3. SUMMARY OF METHOD

- 3.1 Cyanide is released from its complexes and converted to HCN by means of a reflux distillation. The reaction is catalyzed using a magnesium chloride reagent. The HCN is absorbed in a solution of NaOH.
- 3.2 The CN in the NaOH solution is determined spectrophotometrically using an automated system: The cyanide reacts with chloramine T at a pH<8 to form CNCl. Addition of a pyridine barbituric acid reagent produces a red color which absorbs at 578 nm. The intensity of the red color is proportional to the CN concentration.

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF

MERCURY IN WATER

METHOD 245.2 *DNS
(COLD VAPOR, AUTOMATED)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5 CENTRAL REGIONAL LABORATORY
536 SOUTH CLARK STREET (5SCRL)
CHICAGO, ILLINOIS 60605

Date:

CONCURRENCES

TEAM LEADER Peterj. Bickel 9/29/87

SECTION CHIEF John V. Moore 295 9/29/87

QUALITY CONTROL COORDINATOR John V. Moore 10/2/87

LABORATORY DIRECTOR John V. Moore 10/7/87

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
MERCURY IN WATER
METHOD 245.2 *DNS (COLD VAPOR, AUTOMATED)

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| 3. SUMMARY OF METHOD | 1 | 0 | SEPT 87 | 1 |
| 4. SAMPLE HANDLING AND PRESERVATION | 1 | 0 | SEPT 87 | 2 |
| 5. INTERFERENCES | 2 | 0 | SEPT 87 | 2 |
| 6. APPARATUS | 1 | 0 | SEPT 87 | 3 |
| 7. REAGENTS | 3 | 0 | SEPT 87 | 4 |
| 8. PROCEDURE | 2 | 0 | SEPT 87 | 6 |
| 9. CALCULATIONS | 1 | 0 | SEPT 87 | 8 |
| 10. QUALITY CONTROL | 3 | 0 | SEPT 87 | 8 |
| 11. PREVENTATIVE MAINTENANCE | 1 | 0 | SEPT 87 | 10 |
| 12. TROUBLESHOOTING/CORRECTIVE ACTION | 2 | 0 | SEPT 87 | 10 |
| REFERENCES | 1 | 0 | SEPT 87 | |
| ATTACHMENTS | | 0 | SEPT 87 | |

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF
MERCURY IN WATER
METHOD 245.2 *DNS (COLD VAPOR, AUTOMATED)

1. SCOPE AND APPLICATION

- 1.1 This method is applicable to all sample types, including drinking and surface waters; domestic and industrial wastes. Mercury is a primary drinking water parameter with a maximum contaminant level of 0-002 mg/L.
- 1.2 This is an approved alternate test procedure for NPDES (40 CFR 136.3) and SDWA [40 CFR 141.23 (f)].
- 1.3 Only samples with chemical oxygen demand (COD) values less than 700 mg/liter may be analyzed using this method.
- 1.4 The normal working range of the method is 0.1 to 2.0 ug Hg/liter.

2. SAFETY AND WASTE HANDLING

- 2.1 Because of the toxic nature of mercury vapor, precautions must be taken to avoid chronic exposure. This is done by venting the mercury vapor into an exhaust hood or passing the vapor through an absorbing media such as activated carbon. (available from Barnebey and Cheney, E-8th Ave and North Cassidy St. Columbus, OH 43219. Cat. # 580-13 or 580-22).
- 2.2 Hexavalent chromium used to preserve the samples is carcinogenic. The analyst must avoid exposure to Cr^{VI} by wearing gloves and a lab-coat while performing this test.
- 2.3 Unused samples, unused stock preservative, and mercury standards (stock and working) are discarded in the plastic container color coded yellow according to the CRL waste disposal color code system.
- 2.4 All the unused reagents and waste generated at gas-liquid separator is poured down the drain.
(NOTE: The liquid waste generated at gas-liquid separator is collected in a plastic container then it is poured down the drain. Add some NaOH pellets in the drain, then run tap water for 10 minutes).

3. SUMMARY OF METHOD

- 3.1 Samples are analyzed automatically using acidic persulfate at 100°C to oxidize all mercury compounds. The Hg is then reduced using stannous chloride. The resulting elemental Hg is purged from the sample stream and enters the cell of a pulsed dual-wavelength ratio spectrophotometer. The Hg vapor absorbs energy at 253.7 nm. The absorption is proportional to the concentration of Hg in the sample.

APPENDIX C

CONTRACT LABORATORY PROGRAM
ROUTINE ANALYTICAL SERVICES PARAMETERS

APPENDIX C
CONTRACT LAB PROGRAM
RAS ORGANIC PARAMETERS
TARGET COMPOUND LIST

| <u>Volatiles</u> | <u>CAS Number</u> | <u>Detection Limits*</u> | |
|--------------------------------|-------------------|------------------------------|--------------------------------------|
| | | <u>Low Water^a</u> | <u>Low Soil/Sediment^b</u> |
| | | <u>ug/L</u> | <u>ug/Kg</u> |
| 1. Chloromethane | 74-87-3 | 10 | 10 |
| 2. Bromomethane | 74-83-9 | 10 | 10 |
| 3. Vinyl Chloride | 75-01-4 | 10 | 10 |
| 4. Chloroethane | 75-00-3 | 10 | 10 |
| 5. Methylene Chloride | 75-09-2 | 5 | 5 |
| 6. Acetone | 67-64-1 | 10 | 10 |
| 7. Carbon Disulfide | 75-15-0 | 5 | 5 |
| 8. 1,1-Dichloroethene | 75-35-4 | 5 | 5 |
| 9. 1,1-Dichloroethane | 75-35-3 | 5 | 5 |
| 10. 1,2-Dichloroethene (Total) | 156-60-5 | 5 | 5 |
| 11. Chloroform | 67-66-3 | 5 | 5 |
| 12. 1,2-Dichloroethane | 107-06-2 | 5 | 5 |
| 13. 2-Butanone | 78-93-3 | 10 | 10 |
| 14. 1,1,1-Trichloroethane | 71-55-6 | 5 | 5 |
| 15. Carbon Tetrachloride | 56-23-5 | 5 | 5 |
| 16. Vinyl Acetate | 108-05-4 | 10 | 10 |
| 17. Bromodichloromethane | 75-27-4 | 5 | 5 |
| 18. 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | 5 |
| 19. 1,2-Dichloropropane | 78-87-5 | 5 | 5 |
| 20. trans-1,3-Dichloropropene | 10061-02-6 | 5 | 5 |
| 21. Trichloroethene | 79-01-6 | 5 | 5 |
| 22. Dibromochloromethane | 124-48-1 | 5 | 5 |
| 23. 1,1,2-Trichloroethane | 79-00-5 | 5 | 5 |
| 24. Benzene | 71-43-2 | 5 | 5 |
| 25. cis-1,3-Dichloropropene | 10061-01-5 | 5 | 5 |
| 26. 2-Chloroethyl Vinyl Ether | 110-75-8 | 10 | 10 |
| 27. Bromoform | 75-25-2 | 5 | 5 |
| 28. 2-Hexanone | 591-78-6 | 10 | 10 |
| 29. 4-Methyl-2-pentanone | 108-10-1 | 10 | 10 |
| 30. Tetrachloroethene | 127-18-4 | 5 | 5 |
| 31. Toluene | 108-88-3 | 5 | 5 |
| 32. Chlorobenzene | 108-90-7 | 5 | 5 |
| 33. Ethyl Benzene | 100-41-4 | 5 | 5 |
| 34. Styrene | 100-42-5 | 5 | 5 |
| 35. Total Xylenes | | 5 | 5 |

- a. Medium Water Contract Required Detection Limits (CRDL) for Volatile HSL Compounds are 100 times the individual Low Water CRDL.
- b. Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile HSL Compounds are 100 times the individual Low Soil/Sediment CRDL.

APPENDIX C (cont)
CONTRACT LAB PROGRAM
RAS ORGANIC PARAMETERS
TARGET COMPOUND LIST

| <u>Semi-Volatiles</u> | <u>CAS Number</u> | <u>Detection Limits*</u> | |
|---------------------------------|-------------------|--------------------------------------|---|
| | | <u>Low Water^c</u> ug/L | <u>Low Soil/Sediment^d</u> ug/Kg |
| 36. Phenol | 108-95-2 | 10 | 330 |
| 37. bis(2-Chloroethyl)ether | 111-44-4 | 10 | 330 |
| 38. 2-Chlorophenol | 95-57-8 | 10 | 330 |
| 39. 1,3-Dichlorobenzene | 541-73-1 | 10 | 330 |
| 40. 1,4-Dichlorobenzene | 106-46-7 | 10 | 330 |
| 41. Benzyl Alcohol | 100-51-6 | 10 | 330 |
| 42. 1,2-Dichlorobenzene | 95-50-1 | 10 | 330 |
| 43. 2-Methylphenol | 95-48-7 | 10 | 330 |
| 44. bis(2-Chloroisopropyl)ether | 39638-32-9 | 10 | 330 |
| 45. 4-Methylphenol | 106-44-5 | 10 | 330 |
| 46. N-Nitroso-Dipropylamine | 621-64-7 | 10 | 330 |
| 47. Hexachloroethane | 67-72-1 | 10 | 330 |
| 48. Nitrobenzene | 98-95-3 | 10 | 330 |
| 49. Isophorone | 78-59-1 | 10 | 330 |
| 50. 2-Nitrophenol | 88-75-5 | 10 | 330 |
| 51. 2,4-Dimethylphenol | 105-67-9 | 10 | 330 |
| 52. Benzoic Acid | 65-85-0 | 50 | 1600 |
| 53. bis(2-Chloroethoxy)methane | 111-91-1 | 10 | 330 |
| 54. 2,4-Dichlorophenol | 120-83-2 | 10 | 330 |
| 55. 1,2,4-Trichlorobenzene | 120-82-1 | 10 | 330 |
| 56. Naphthalene | 120-82-1 | 10 | 330 |
| 57. 4-Chloroaniline | 106-47-8 | 10 | 330 |
| 58. Hexachlorobutadiene | 87-68-3 | 10 | 330 |
| 59. 4-Chloro-3-methylphenol | 59-50-7 | 10 | 330 |
| (para-chloro-meta-cresol) | 59-50-7 | 10 | 330 |
| 60. 2-Methylnaphthalene | 91-57-6 | 10 | 330 |
| 61. Hexachlorocyclopentadiene | 77-47-4 | 10 | 330 |
| 62. 2,4,6-Trichlorophenol | 88-06-2 | 10 | 330 |
| 63. 2,4,5-Trichlorophenol | 95-95-4 | 50 | 1600 |
| 64. 2-Chloronaphthalene | 91-58-7 | 10 | 330 |
| 65. 2-Nitroaniline | 88-74-7 | 50 | 1600 |
| 66. Dimethyl Phthalate | 131-11-3 | 10 | 330 |
| 67. Acenaphthylene | 208-96-8 | 10 | 330 |
| 68. 3-Nitroaniline | 99-09-2 | 50 | 1600 |
| 69. Acenaphthene | 83-32-9 | 10 | 330 |
| 70. 2,4-Dinitrophenol | 51-28-5 | 50 | 1600 |
| 71. 4-Nitrophenol | 100-02-7 | 50 | 1600 |
| 72. Dibenzofuran | 132-64-9 | 10 | 330 |
| 73. 2,4-Dinitrotoluene | 121-14-2 | 10 | 330 |
| 74. 2,6-Dinitrotoluene | 606-20-2 | 10 | 330 |

APPENDIX C (cont)
CONTRACT LAB PROGRAM
RAS ORGANIC PARAMETERS
TARGET COMPOUND LIST

| <u>Semi-Volatiles (cont)</u> | <u>CAS Number</u> | <u>Detection Limits*</u> | |
|---------------------------------|-------------------|------------------------------|--------------------------------------|
| | | <u>Low Water^c</u> | <u>Low Soil/Sediment^d</u> |
| | | <u>ug/L</u> | <u>ug/Kg</u> |
| 75. Diethylphthalate | 84-66-2 | 10 | 330 |
| 76. 4-Chlorophenyl Phenyl Ether | 7005-72-3 | 10 | 330 |
| 77. Fluorene | 86-73-7 | 10 | 330 |
| 78. 4-Nitroaniline | 100-01-6 | 50 | 1600 |
| 79. 4,6-Dinitro-2-methylphenol | 534-52-1 | 50 | 1600 |
| 80. N-nitrosodiphenylamine | 86-30-6 | 10 | 330 |
| 81. 4-Bromophenyl Phenyl Ether | 101-55-3 | 10 | 330 |
| 82. Hexachlorobenzene | 118-74-1 | 10 | 330 |
| 83. Pentachlorophenol | 87-86-5 | 50 | 1600 |
| 84. Phenanthrene | 85-01-8 | 10 | 330 |
| 85. Anthracene | 120-12-7 | 10 | 330 |
| 86. Di-n-butylphthalate | 84-74-2 | 10 | 330 |
| 87. Fluoranthene | 206-44-0 | 10 | 330 |
| 88. Pyrene | 129-00-0 | 10 | 330 |
| 89. Butyl Benzyl Phthalate | 85-68-7 | 10 | 330 |
| 90. 3,3'-Dichlorobenzidine | 91-94-1 | 20 | 660 |
| 91. Benzo(a)anthracene | 56-55-3 | 10 | 330 |
| 92. bis(2-ethylhexyl)phthalate | 117-81-7 | 10 | 330 |
| 93. Chrysene | 218-01-9 | 10 | 330 |
| 94. Di-n-octyl Phthalate | 117-84-0 | 10 | 330 |
| 95. Benzo(b)fluoranthene | 205-99-2 | 10 | 330 |
| 96. Benzo(k)fluoranthene | 207-08-9 | 10 | 330 |
| 97. Benzo(a)pyrene | 50-32-8 | 10 | 100 |
| 98. Indeno(1,2,3-cd)pyrene | 193-39-5 | 10 | 330 |
| 99. Dibenz(a,h)anthracene | 53-70-3 | 10 | 330 |
| 100. Benzo (g,h,i)perylene | 191-24-2 | 10 | 330 |

c. Medium Water Contract Required Detection Limits (CRDL) for Semi-Volatile HSL Compounds are 100 times the individual Low Water CRDL.

d. Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Semi-Volatile HSL Compounds are 60 times the individual Low Soil/Sediment CRDL.

APPENDIX C (cont)
CONTRACT LAB PROGRAM
RAS ORGANIC PARAMETERS
TARGET COMPOUND LIST

Pesticides:

| | | | |
|--------------------------|------------|------|-------|
| 101. alpha-BHC | 319-84-6 | 0.05 | 8.0 |
| 102. beta-BHC | 319-85-7 | 0.05 | 8.0 |
| 103. delta-BHC | 319-86-8 | 0.05 | 8.0 |
| 104. gamma-BHC (lindane) | 58-89-9 | 0.05 | 8.0 |
| 105. Heptachlor | 76-44-8 | 0.05 | 8.0 |
| 106. Aldrin | 309-00-2 | 0.05 | 8.0 |
| 107. Heptachlor Epoxide | 1024-57-3 | 0.05 | 8.0 |
| 108. Endosulfan I | 959-98-8 | 0.05 | 8.0 |
| 109. Dieldrin | 60-57-1 | 0.10 | 16.0 |
| 110. 4,4'-DDE | 72-55-9 | 0.10 | 16.0 |
| 111. Endrin | 72-20-8 | 0.10 | 16.0 |
| 112. Endosulfan II | 33213-65-9 | 0.10 | 16.0 |
| 113. 4,4'-DDD | 72-54-8 | 0.10 | 16.0 |
| 114. Endosulfan Sulfate | 1031-07-8 | 0.10 | 16.0 |
| 115. 4,4'-DDT | 50-29-3 | 0.10 | 16.0 |
| 116. Endrin Ketone | 53494-70-5 | 0.10 | 16.0 |
| 117. Methoxychlor | 72-43-5 | 0.5 | 80.0 |
| 118. Chlordane | 57-74-9 | 0.5 | 80.0 |
| 119. Toxaphene | 8001-35-2 | 1.0 | 160.0 |
| 120. Aroclor-1016 | 12674-11-2 | 0.5 | 80.0 |
| 121. Aroclor-1221 | 11104-28-2 | 0.5 | 80.0 |
| 122. Aroclor-1232 | 11141-16-5 | 0.5 | 80.0 |
| 123. Aroclor-1242 | 53469-21-9 | 0.5 | 80.0 |
| 124. Aroclor-1248 | 12672-29-6 | 0.5 | 80.0 |
| 125. Aroclor-1254 | 11097-69-1 | 1.0 | 160.0 |
| 126. Aroclor-1260 | 11096-82-5 | 1.0 | 160.0 |

- e. Medium Water Contract Required Detection Limits (CRDL) for Pesticide HSL Compounds are 100 times the individual Low Water CRDL.
- f. Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Pesticide HSL compounds are 15 times the individual Low Soil/Sediment CRDL.
- * Detection Limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.
- ** Specific detection limits are highly matrix dependent. the detection limits listed herein are provided for guidance and may not always be achievable.

APPENDIX C (cont)
CONTRACT LAB PROGRAM
RAS INORGANIC PARAMETERS
TARGET ANALYTE LIST

Compound

Metals:

CRDL*

| | | |
|-----|-----------|------|
| 1. | Aluminum | 200 |
| 2. | Antimony | 60 |
| 3. | Arsenic | 10 |
| 4. | Barium | 200 |
| 5. | Beryllium | 5 |
| 6. | Cadmium | 5 |
| 7. | Calcium | 5000 |
| 8. | Chromium | 10 |
| 9. | Cobalt | 50 |
| 10. | Copper | 25 |
| 11. | Iron | 100 |
| 12. | Lead | 5 |
| 13. | Magnesium | 5000 |
| 14. | Manganese | 15 |
| 15. | Mercury | 0.2 |
| 16. | Nickel | 40 |
| 17. | Potassium | 5000 |
| 18. | Selenium | 5 |
| 19. | Silver | 10 |
| 20. | Sodium | 5000 |
| 21. | Thallium | 10 |
| 22. | Tin | 40 |
| 23. | Vanadium | 50 |
| 24. | Zinc | 20 |
| 25. | Cyanide | 10 |

* CRDL - Contract Required Detection Limit (ug/l)